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Systematics of the spiny trapdoor spiders of the genus *Cataxia* (Mygalomorphae: Idiopidae) from south-western Australia: documenting a threatened fauna in a sky-island landscape

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Abstract. The spiny trapdoor spiders (Idiopidae) of the *Cataxia bolganupensis*-group from south-western Australia are revised, and six species are recognized: *C. barrettae* sp. nov., *C. bolganupensis* (Main, 1985), *C. colesi* sp. nov., *C. melindae* sp. nov., *C. sandsorum* sp. nov. and *C. stirlingi* (Main, 1985). All species exhibit extreme short-range endemism, with allopatric sky-island distributions in mesic montane habitats of the Stirling Range, Porongurup Range and Mount Manypeaks. A molecular phylogenetic analysis of mitochondrial cytochrome *c* oxidase subunit I (*CO1*) and cytochrome b (*CYB*) sequences complements the morphological taxonomy, along with a key to species and detailed information on their distributions and habitat preferences. All six species are assessed as 'endangered' using IUCN criteria, with the major threatening processes being the spread of the plant pathogenic fungus *Phytophthora* (causing dieback), climate change and inappropriate fire regimes.

Keywords: Taxonomy, new species, mesic zone, biodiversity hotspot, biogeography

ZooBank publication: http://zoobank.org/?lsid=urn:lsid:zoobank.org:pub:0F9FBAE7-841C-4758-BBF8-6F447E375219

The spiny trapdoor spiders of the *Cataxia bolganupensis*-group (Figs. 1–9) are an iconic component of south-western Australia's mygalomorph spider fauna, recognized for their unusual 'sky-island' biogeography (see Hedin et al. 2015), habitat specificity and highly restricted distributions, i.e., short-range endemism (Main 1993b; Barrett & Yates 2015; Rix et al. 2015). Found only in temperate montane habitats of the Stirling Range, Porongurup Range and Mount Manypeaks, in Western Australia's Great Southern Region north and east of Albany (Figs. 10, 14–17), these spiders have been the subject of ongoing ecological study and taxonomic comparison since Main (1985) described the first two species. Detailed survey work in the intervening years has clarified the discrete, highly localized and markedly allopatric distributions of each of these described species, and revealed populations of four additional undescribed species in surrounding mountainous areas (Figs. 10–16). Together, these six species form a monophyletic (Rix et al. 2017a; Fig. 17) and morphologically distinctive assemblage, now restricted to just a handful of mesic upland habitats in the south-western Australian biodiversity hotspot (Rix et al. 2015, 2017c).

The first and only previously described species in the *bolganupensis*-group of *Cataxia* Rainbow, 1914 – *C. bolganupensis* (Main, 1985) and *C. stirlingi* (Main, 1985) (Figs. 1, 4) – were both originally placed in the genus *Neohomogona* Main, 1985, the identity of which vacillated for a number of years. Raven (1985), in an addendum following the publication of Main (1985), first synonymized *Neohomogona* with *Cataxia*, noting what were interpreted as diagnostic autapomorphies in the former, such as the reduction or absence of posterior median spinnerets. Main (1993a) then re-erected *Neohomogona*, although Raven's (1985) synonymy was later upheld by Rix et al. (2017c), following a detailed molecular phylogenetic analysis of Australian Idiopidae (Rix et al. 2017a). While the *bolganupensis*-group of *Cataxia*, synonymous with Main's (1985, 1993a) concept of *Neohomogona* (= *Cataxia*), is almost certainly reciprocally monophyletic relative to other Cataxiini, the genus *Cataxia* (*sensu* Rix et al. 2017c) is overall a relatively homogeneous assemblage of species, most of which occur in the mesic zone of eastern Australia, and all of which are united in a single crown-group lineage (Rix et al. 2017a). Western Australian taxa in the *bolganupensis*-group are, however, unusual in having lost the posterior median spinnerets (Figs. 45, 67), and in having lost any semblance of burrow door-building behavior. Indeed, all Western Australian species build ornate, open-holed palisade burrows, which they usually adorn with a radial skirt of leaves, twigs and other debris (Figs. 7–9). To the trained eye these distinctive burrows are useful markers for detecting the presence or otherwise of spiders in suitable habitats.

The aims of this revision are thus two-fold. Firstly, we describe the known species of *Cataxia* from Western Australia using morphological and complementary molecular criteria, thus adding another fully revised lineage to a growing list of well-documented arachnid and myriapod taxa with short-range endemic sky-island distributions in the same montane areas (e.g., see Rix et al. 2009; Edward & Harvey 2010; Cooper et al. 2011; Rix & Harvey 2012a, b; Harvey et al. 2015; Rix et al. 2015). Secondly, we assess the conservation status of this potentially threatened fauna using IUCN criteria, as per

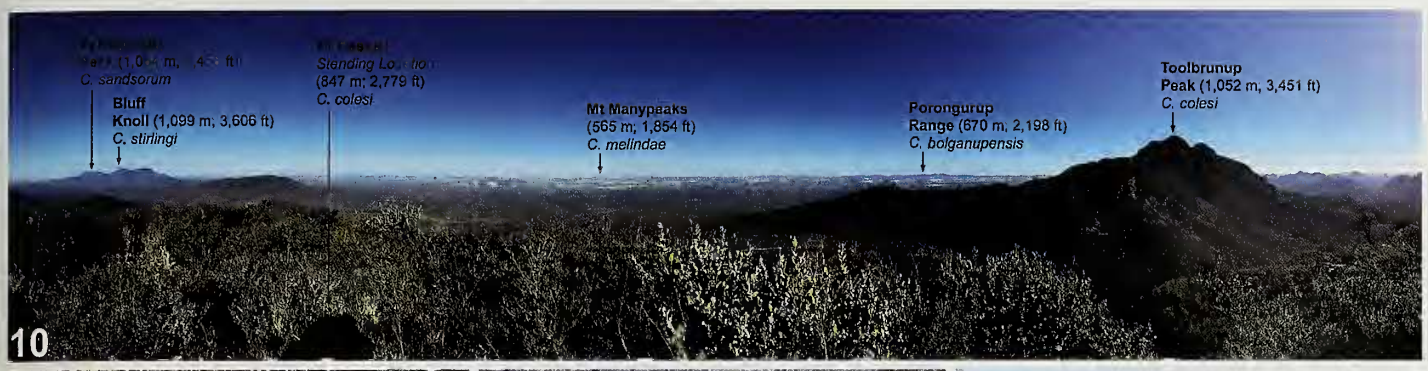
Figures 1–9.—Images of live specimens and burrows of *Cataxia* of the *bolganupensis*-group from south-western Australia: 1, female *C. bolganupensis* (Main) from Porongurup National Park; 2, female *C. colesi* sp. nov. from Toolbrunup Peak, Stirling Range National Park; 3, female *C. sandsorum* sp. nov. from south face of Pyungoorup Peak, Stirling Range National Park (missing left pedipalp); 4, *C. stirlingi* (Main) from Bluff Knoll, Stirling Range National Park; 5, female *C. barrettae* sp. nov. from Mondurup Peak, Stirling Range National Park; 6, male *C. barrettae* sp. nov. from Talyuberlup Peak, Stirling Range National Park; 7, burrow of *C. stirlingi* (Main) from Bluff Knoll, Stirling Range National Park; 8, burrow of *C. sandsorum* sp. nov. from south face of Pyungoorup Peak, Stirling Range National Park; 9, burrow of *C. barrettae* sp. nov. from Talyuberlup Peak, Stirling Range National Park. Images by M. Harvey.

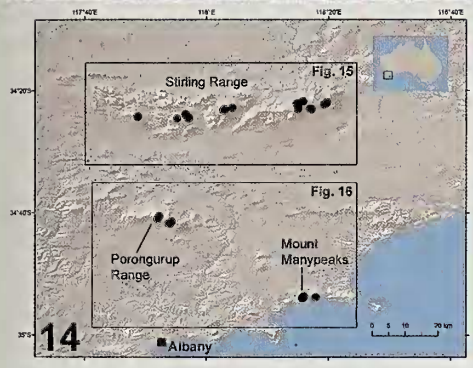
Harvey et al. (2015). South-western Western Australia is a highly diverse yet threatened biodiversity hotspot (Myers et al. 2000; Rix et al. 2015), and conservation considerations are necessarily central to any synopsis of the region's remarkable biota, including trapdoor spiders (Rix et al. 2017b). Six species of south-western Australian *Cataxia* are recognized in this study, taking the total number of described species in the genus to 15.

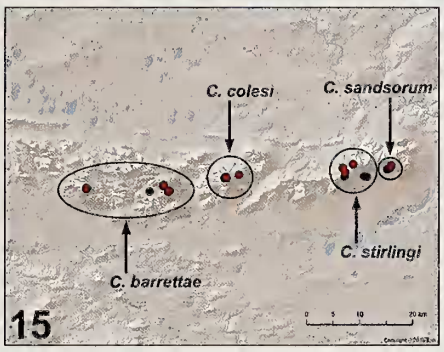
METHODS

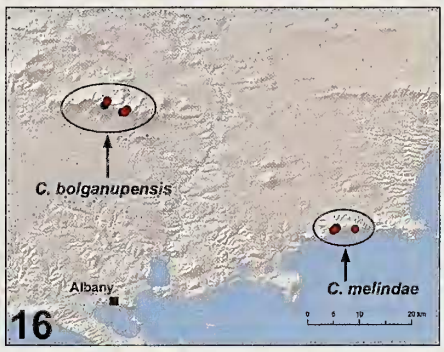
Species concepts.—The species concepts applied in this paper are unified (de Queiroz 2007) and integrative, combining morphological autapomorphy with molecular monophyly as assessed using a mitochondrial barcoding approach. These molecular data thus complement the morphological synopsis, and are included: (1) to test the congruence between morphological data and mitochondrial genetic signal; and (2) to provide diagnostic molecular autapomorphies, numbered according to standard sequences. The data are not intended to explore the phylogenetic relationships among species, or the phylogeography of included lineages; these analyses will be conducted in a forthcoming multi-locus treatment. Cytochrome *c* oxidase subunit I (*CO1*) and cytoehrome b (*CYB*) reference sequences for the numbering of nucleotides in diagnoses are derived from a specimen of *C. bolganupensis* (WAM T131631), as follows: *CO1* (658 bp, GenBank accession number KY295345); *CYB* (686 bp, GenBank accession number KY295466).

Morphological methods.—Morphological methods, including the format of species descriptions, follow Rix et al. (2017c). Specimens were examined using a Zeiss Stemi SV11 stereomi-









Figures 10–16.—Habitats and distributions of *Cataxia* of the *bolganupensis*-group: 10, panoramic image showing almost the entire distribution of *Cataxia* in south-western Australia (excluding only the range of *C. barrettae* sp. nov. on Talyuberlup Peak, Mount Magog and Mondurup Peak), taken in an easterly (left) to south-westerly (right) arc from the summit of Mount Hassell, Stirling Range National Park (SRNP); 11, mesic closed woodland habitat of *C. colesi* sp. nov. on the southern slope of Toolbrunup Peak (SRNP); 12, riparian habitat of *C. sandsorum* sp. nov. on the south face of Pyungoorup Peak (SRNP); 13, montane heathland habitat of *C. barrettae* sp. nov. on the summit of Mondurup Peak (SRNP); 14–16, maps showing collection records of *Cataxia* from south-western Australia; red dots denote specimens sequenced for the molecular analyses. See inset map in Fig. 14 for the location of the mapped area relative to the rest of Australia. Images (10, 13) by M. Harvey; images (11–12) by M. Rix.

croscope, and female genitalia were cleared in 100% lactic acid at room temperature. Measurements (in millimetres, to one decimal place) and digital automontage images were taken using a Leica M165C stereomicroscope with mounted DFC425 digital camera, and processed using Leica Application Suite Version 3.7 software. Species are presented in this paper in alphabetical order. Leg segments were measured along the dorsal prolateral edge, in prolateral view. Total body length measurements include the chelicerae, in dorsal view. Eleven (of 12) available male specimens of *Cataxia* from south-western Australia were illustrated for this study, either within the primary numbered plates or, for additional specimens, as an 'Atlas' series of more rapidly assembled single-shot images in four standard views (see Supplementary File 1, online at http://dx.doi.org/10.1636/JoA-S-17-012.S1). The latter are included for ease of comparison to the type specimens, to directly illustrate the subtle morphological variation in key characters typical of Mygalomorphae, and to provide a digital record of the specimens available in collections.

Specimens are lodged at the Western Australian Museum, Perth (WAM), either in the primary registered collection, or in the former personal collection of one of us (WAM BYM Collection). The following abbreviations are used throughout the text: ALE, anterior lateral eye/s; AME, anterior median eye/s; *CO1*, cytochrome *c* oxidase subunit I; *CYB*, cytochrome b; IBRA, Interim Biogeographic Regionalisation of Australia Version 7 (online at https://www.environment.gov.au/land/nrs/science/ibra; accessed May 2017); PLE, posterior lateral eye/s; PME, posterior median eye/s; PMS, posterior median

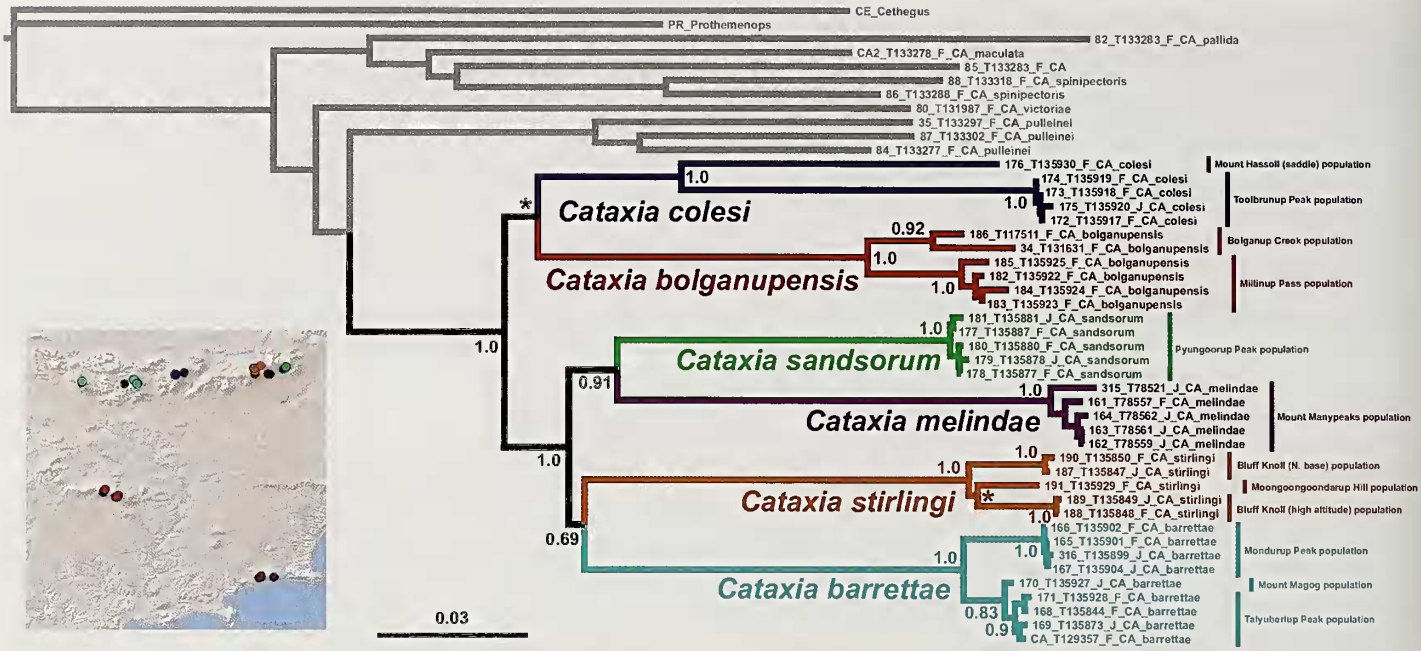


Figure 17.—Tamura-Nei neighbour-joining tree of concatenated *CO1* (658 bp) and *CYB* (686 bp) data for 35 specimens of *Cataxia* in the *bolganupensis*-group, color-coded and annotated according to species designation and distribution (see inset map). Posterior probabilities resulting from a partitioned Bayesian analysis of the same dataset are shown at each major node; two highlighted (*) clades were not recovered in the Bayesian 50% majority-rule consensus tree. See inset map in Figure 14 for the location of the mapped area relative to the rest of Australia.

spinnerets; RTA, retrolateral tibial apophysis (of male pedipalp).

Molecular methods.—Mitochondrial *CO1* and *CYB* sequences were generated for 35 specimens of *Cataxia* in the *bolganupensis*-group, using a next-generation parallel tagged amplicon sequencing (TAS) approach, described in detail by Rix et al. (2017a). For each specimen sequenced, DNA voucher codes and GenBank accession numbers are provided next to repository registration numbers in the material examined section for each species (below), in the form: [DNA_Voucher_Code; GB_CO1_No.; GB_CYB_No.]. Outgroup sequences were obtained from data previously published by Rix et al. (2017a). The ultimate outgroup for the molecular analyses was the diplurid spider *Cethegus fugax* (Simon, 1908). Other outgroups included several speeies of Idiopidae, including an undescribed species of *Prothemenops* Schwendinger, 1991, and nine of the 10 non-*bolganupensis*-group Cataxiini sequenced by Rix et al. (2017a). In total, mitochondrial sequences were analyzed for 46 specimens (Supplementary File 2, online at http://dx.doi.org/10.1636/JoA-S-17-012.S2).

Alignments for both the *CO1* (658 bp) and *CYB* (686 bp) datasets were conducted in Geneious R6 (Biomatters Ltd.; online at http://www.geneious.com/; accessed May 2017), using the MAFFT v7.017 plugin with default parameters. For the resulting concatenated (1,344 bp; no indels) dataset (see Supplementary File 2, online at http://dx.doi.org/10.1636/JoA-S-17-012.S2), Geneious R6 was used to generate a neighbor-joining tree using a Tamura-Nei genetic distance model, and uncorrected pairwise distance comparisons were calculated in MEGA v6.06 (Tamura et al. 2013). Prior to Bayesian analysis, PartitionFinder Version 1.1.1 (Lanfear et al. 2012) was used to simultaneously choose an optimal partitioning scheme and appropriate models of nucleotide substitution, favoring a four-partition model (i.e., TVM+G for *CO1+CYB* codon position one [cp1]; TrN+I+G for *CO1+CYB* cp3; TVM+G for *CO1* cp2; and HKY+G for *CYB* cp2). These partitions were then analyzed in MrBayes Version 3.1.2 (Huelsenbeck & Ronquist 2001; Ronquist & Huelsenbeck 2003), with substitution model parameters estimated independently for each partition ([Unlink tratio = (all) pinvar=(all) shape=(all) statefreq=(all) revmat=(all)]) and rates allowed to vary across partitions ([Prset applyto=(all) ratepr=variable]). Four Markov Chain Monte Carlo (MCMC) chains were run for 10 million generations, sampling every 1000 generations, with the first 10% of sampled trees discarded as 'burnin' ([burnin = 1000]). Summary statisties of estimated parameters, including ESS values, were assessed using Tracer Version 1.6 (Rambaut et al. 2014), and FigTree Version 1.4.2 (online at http://tree.bio.ed.ac.uk/software/figtree/; accessed May 2017) was used to visualise a 50% majority-rule consensus tree of the post-burnin sample.

Conservation assessments.—The conservation of Australian trapdoor spiders may be an issue of national significanee (Rix et al. 2017b), and the eonservation status of each species of *Cataxia* from south-western Australia was assessed using a standard International Union for the Conservation of Nature (IUCN) approach, similar to that applied by Harvey et al. (2015) for migid trapdoor spiders of the genus *Bertmainius* Harvey, Main, Rix & Cooper, 2015. As long-term data on population reductions (Criterion A), population sizes or declines (Criterion C) or the number of mature individuals in any one population (Criterion D) were not available, we assessed all taxa using information on their

geographic range (Criterion B). These assessments therefore focused on the extent of occurrence of each species, the area of occupancy within that range, and the health or otherwise of occupied habitats. Individual assessments are listed for each species under their relevant entry in the Taxonomy section (below).

RESULTS AND DISCUSSION

Molecular analyses.—Bayesian analysis of the eoncatenated *CO1* and *CYB* data recovered six major clades, eaeh concordant with the morphological species hypotheses presented below; these results are presented on a single neighbor-joining tree (Fig. 17) for ease of pairwise distance comparison. Mean intra-specific pairwise divergence distances for the concatenated dataset ranged from 4.8% in *C. colesi* sp. nov., to between 0.3% and 3.0% in *C. sandsorum* sp. nov. and *C. bolganupensis*, respectively. Mean inter-specific pairwise distances varied from 14.2% between *C. melindae* sp. nov. and *C. sandsorum* sp. nov., to 18.3% between *C. bolganupensis* and *C. stirlingi*. Pairwise divergences for *CO1* and *CYB* were each largely proportional to the concatenated dataset, with *CYB* contributing a slightly higher rate relative to *CO1*, as follows: *CO1* (mean intra-specific = 0% – 4.2%; mean inter-specific = 10.6% – 16.3%); *CYB* (mean intra-speeific = 0.6% – 5.5%; mean inter-specific = 16.2% – 22.8%). Summary pairwise distance matrices for all three datasets are presented in Supplementary File 3 (online at http://dx.doi.org/10.1636/JoA-S-17-012.S3).

Mitochondrial genetic structure was evident between all major populations (Fig. 17), including within seemingly homogeneous habitats (e.g., in *C. bolganupensis* in the Porongurup National Park). Similarly, in the Toolbrunup-Hassell uplands, populations of *C. colesi* sp. nov. on Toolbrunup Peak and the Mount Hassell saddle showed deep mitochondrial genetie divergence. These data, while clearly preliminary in the absence of nuclear markers, are consistent with the disjunet nature of individual populations in the field, and highlight potential barriers to effective dispersal (at least of females) in these complex montane environments.

Conservation assessments.—All six species of western Australian *Cataxia* were assessed as threatened using IUCN criteria, even conservatively applying Criteria B1 and B2. The total of area of occupaney (Criterion B2) of each species is not more than 10 km^2, and usually significantly less. For example, on Mondurup Peak in the western Stirling Range National Park, surveys have revealed that the single local population of *C. barrettae* sp. nov. is restricted to just a 50 m zone of altitude on the summit of the mountain, above ca. 770 m (M. Rix, M. Harvey, pers. obs.). This represents a total area of occupancy at this site of no more than 10 hectares. Together, these geographic occurrence data reveal just how localized populations of *Cataxia* are in the sky-island landscapes of the Great Southern Region, and we eonsider our current knowledge to be accurate given the decades of dedicated survey work that has been undertaken by various workers throughout the area.

The final conservation consideration in each case, in addition to criteria B1 and B2a, was therefore related to assessing any decline in the area, extent and/or quality of habitat (Criterion B2b[iii]). Severe habitat declines due to *Phytophthora* – a pathogenie fungus causing plant dieback (Shearer et al. 2004) – are a major concern in the Great Southern Region of south-western Australia, as are inappropriate fire regimes in sensitive montane habitats, and a potential increase in the frequency and/or intensity of wildfires due to elimate change (see Barrett & Yates 2015 for a detailed summary of these issues in the Stirling Range National Park; and Laurance et al. 2011 for a summary of risks to the Mediterranean-climate ecosystems of south-western Australia more generally). *Cataxia* are susceptible to wildfires in the short term (Main 1993b), and entirely dependent upon mesic, sheltered mierohabitats in the long term; these documented habitat changes and future risks clearly qualify for listing under Criterion B2b[iii]. As a result, all six species were assessed as: B1, B2a, b[iii] ('endangered'). Some species, such as *C. sandsorum* sp. nov., may be realistically assessed as 'critically endangered' in the near future, if habitat degradation in the eastern Stirling Range continues (see Barrett & Yates 2015).

TAXONOMY

Family Idiopidae Simon, 1889
Subfamily Arbanitinae Simon, 1903
Tribe Cataxiini Rainbow, 1914
Genus *Cataxia* Rainbow, 1914

Cataxia Rainbow, 1914: 222.

Homogona Rainbow, 1914: 189. Type species *H. pulleinei* Rainbow, 1914, by monotypy (synonymized by Raven, 1985: 154 *contra* Main, 1993a: 600).

Neohomogona Main, 1985: 42. Type species *N. bolganupensis* Main, 1985, by original designation (synonymized by Raven, 1985: 175 *contra* Main, 1993a: 600)

Type species.—*Cataxia maculata* Rainbow, 1914, by monotypy.

Diagnosis.—Species of *Cataxia* can be distinguished from other Arbanitinae by the presence of a non-hirsute, glabrous carapace, combined with the absence of leg scopulae on females, and the absence of scopulae on the anterior leg metatarsi of males (Rix et al. 2017c).

Distribution.—The genus *Cataxia* has been recorded from extreme south-western Australia and eastern mainland Australia, from the Wet Tropics (Queensland) south to western Victoria. *Cataxia* are absent from Tasmania, South Australia and the central arid zone (Rix et al. 2017c).

Composition and remarks.—The genus *Cataxia* includes 15 described species: *C. babindaensis* Main, 1969, *C. barrettae* sp. nov., *C. bolganupensis* (Main, 1985), *C. colesi* sp. nov., *C. cunicularis* (Main, 1983), *C. dietrichae* Main, 1985, *C. eungellaensis* Main, 1969, *C. maculata* Rainbow, 1914, *C. melindae* sp. nov., *C. pallida* (Rainbow & Pulleine, 1918), *C. pulleinei* (Rainbow, 1914), *C. sandsorum* sp. nov., *C. spinipectoris* Main, 1969, *C. stirlingi* (Main, 1985) and *C. victoriae* (Main, 1985). Numerous undescribed species are also known from mesic habitats in eastern Australia, especially the rainforests of eastern Queensland (Rix et al. 2017c).

THE *BOLGANUPENSIS*-GROUP

The *bolganupensis*-group comprises six species of *Cataxia*, all endemic to the Great Southern Region of south-western Western Australia (Fig. 14). Together they form a reciprocally monophyletic assemblage, relative to the *maculata*-group and the *pulleinei*-group (previously *Homogona* Rainbow, 1914 = *Cataxia*) (Rix et al. 2017a, c). They can be distinguished from other species of *Cataxia* by the reduction or absence of posterior median spinnerets (Figs. 45, 67), and by the unique morphology of their ornate, open-holed, palisade burrows (Figs. 7–9).

KEY TO THE SPECIES OF *CATAXIA* FROM SOUTH-WESTERN WESTERN AUSTRALIA

NB. Distributions are included, as follows: PNP, Porongurup National Park; SRNP, Stirling Range National Park; MMNR, Mount Manypeaks Nature Reserve (Fig. 14).

1. Males 2
– Females 7
2. Tibia of leg I with pair of opposing prolateral clasping spurs (Figs. 48, 70, 92, 114) 3
– Tibia of leg I without pair of prolateral elasping spurs (Figs. 26, 135) 6
3. Lateral margins of carapace sharply indented between level of coxae II and III (Fig. 105); cheliceral paturons each with pair of deep concave depressions (Fig. 107) ..... *C. sandsorum* sp. nov. (SRNP)
– Carapace without lateral indentations; chelicerae unmodified. 4
4. Pedipalpal tibia relatively long, ~2.0 x longer than wide (Figs. 49, 71) 5
– Pedipalpal tibia relatively stout, ~1.7 x longer than wide (Fig. 93) ..... *C. melindae* sp. nov. (MMNR)
5. RTA with relatively dense field of spinules, largely restricted to antero-dorsal surface of RTA (Figs. 49, 50); spinules on curved retro-ventral margin of palpal tibia small and irregularly-arranged (Figs. 49, 50) ..... *C. bolganupensis* (Main, 1985) (PNP)
– RTA with relatively sparse field of spinules, extending onto retrolateral surface of RTA (Figs. 71, 72); spinules on curved retro-ventral margin of palpal tibia larger and more uniformly arranged between RTA and distal retrolateral tibial apophysis (Figs. 71, 72) ..... *C. colesi* sp. nov. (SRNP)
6. RTA short, stout and broadly rounded distally in retrolateral view (Fig. 136); pair of macrosetae on distal margin of prolateral tibia I relatively long and thin, not markedly differentiated from other spine-like setae on tibia (Fig. 135).... *C. stirlingi* (Main, 1985) (SRNP)
– RTA proportionally longer and more pointed distally in retrolateral view (Fig. 27); pair of macrosetae on distal margin of prolateral tibia I shorter, more strongly developed and clearly differentiated from other spine-like setae on tibia (Fig. 26) ..... *C. barrettae* sp. nov. (SRNP)
7. Sternum short, sub-eircular or subquadrate in ventral view, almost as wide as long (Fig. 101)... *C. melindae* sp. nov. (MMNR)
– Sternum clearly longer than wide, rectangular or oval in ventral view (Figs. 35, 57, 79, 123, 144) 8
8. Ventral tibia I with row of at least 5 porrect, spine-like macrosetae (Figs. 58, 59)... *C. bolganupensis* (Main, 1985) (PNP)
– Ventral tibia I with no more than 4 porrect spine-like macrosetae (Figs. 36, 37, 80, 81, 124, 125, 145, 146)..... 9
9. Labium with sparse field of spinules posteriorly (Figs. 34, 143)..... *C. barrettae* sp. nov. (SRNP) and *C. stirlingi* (Main, 1985) (SRNP)*
– Labium without field of spinules (Figs. 78, 122)..... 10
10. Posterior eye row as wide as or wider than anterior eye row (Fig. 77); pars cephalica with relatively low profile in lateral view (Fig. 76) ..... *C. colesi* sp. nov. (SRNP)
– Anterior eye row marginally broader than posterior eye row (Fig. 121); pars cephalica with relatively high profile in lateral view (Fig. 120) ..... *C. sandsorum* sp. nov. (SRNP)

*By our assessment, females of *C. barrettae* and *C. stirlingi* appear to be indistinguishable morphologically; males or molecular data are required for accurate identification.

Cataxia barrettae Rix, Bain, Main & Harvey, sp. nov.
http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:7E916DCC-1C89-465A-86E9-90132B1EE881
(Figs. 5–6, 9, 15, 18–38)

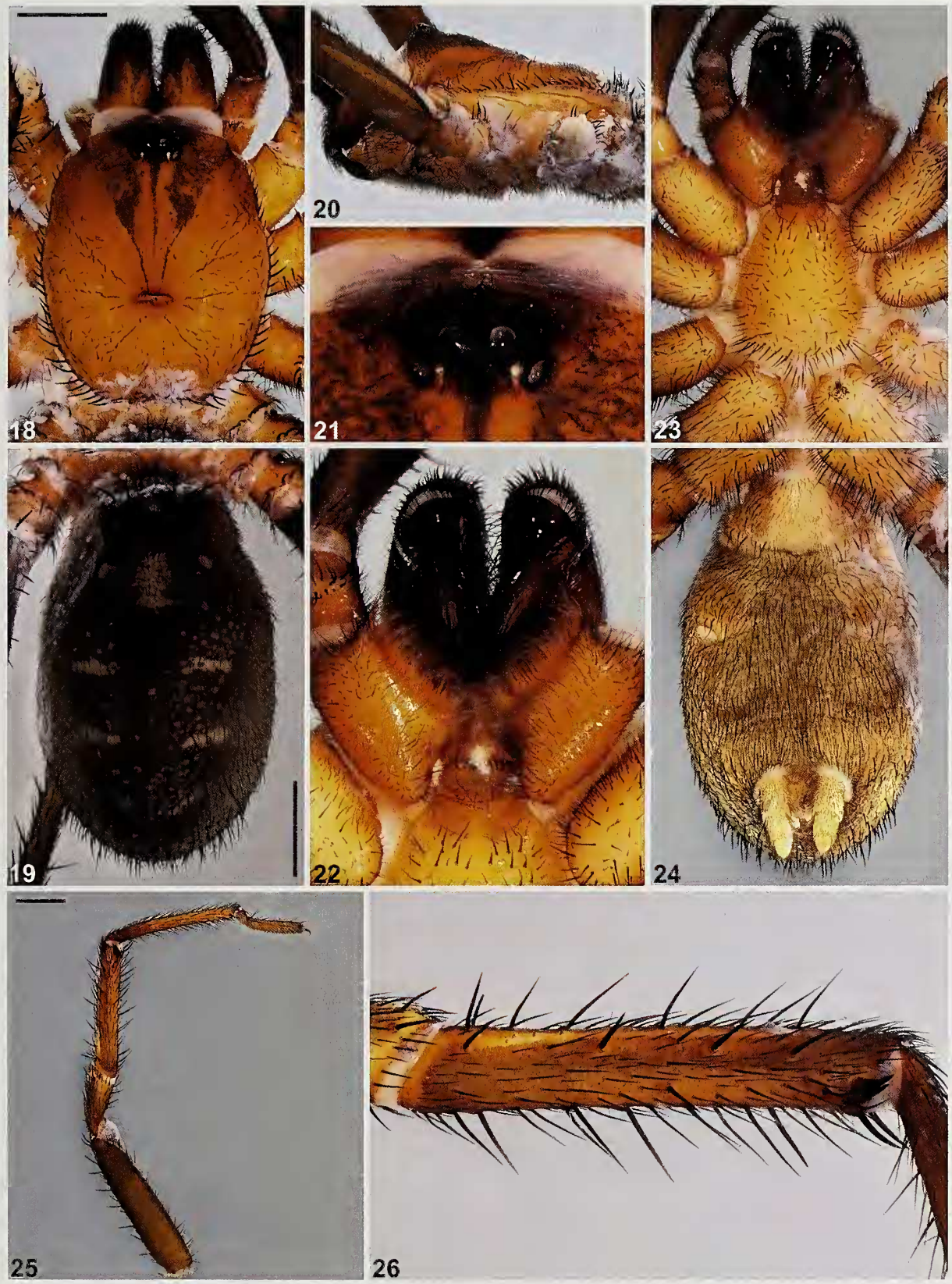
Neohomogona stirlingi Main, 1985: 47 (in part; male specimens likely mislabeled as from "Mount Hassell").

Cataxia sp. 'T129357' Rix et al., 2017a: 304 (molecular exemplar specimen with taxon code 'CA'); Rix et al., 2017c: 622, fig. 266.

Type material.—*Holotype male.* AUSTRALIA: *Western Australia*: Stirling Range National Park, Talyuberlup Peak, track to summit (IBRA_ESP), 34°24′28″S, 117°57′10″E, 15 April 2015, dug from burrow [and molted to maturity November 2015], 589 m, M.G. Rix, M.S. Harvey (WAM T135872).

Paratype. AUSTRALIA: *Western Australia*: 1 ♀, same data as holotype except 34°24′28″S, 117°57′11″E, 14 April 2015, dug from burrow, 555 m, M.G. Rix, M.S. Harvey, N.J. Tatarnic, A. Coles (WAM T135844, DNA_Voucher_168, GB_CO1_KY485321, GB_CYB_KY485354).

Other material examined.—AUSTRALIA: *Western Australia*: 1 ♀, Stirling Range National Park, Talyuberlup Peak (IBRA_ESP), 34°24′34″S, 117°57′05″E, 13 December 2014, dug from burrow, K. Bain (WAM T135928, DNA_Voucher_171, GB_CO1_KY485320, GB_CYB_KY485353); 1 juve-



Figures 18–26.—*Cataxia barrettae* sp. nov., male holotype (WAM T135872), somatic morphology: 18–19, carapace and abdomen, dorsal view; 20, cephalothorax, lateral view; 21, eyes, dorsal view; 22, mouthparts, ventral view; 23–24, cephalothorax and abdomen, ventral view; 25, leg I, prolateral view; 26, leg I tibia, prolateral view. Scale bars = 2.0.

Figures 27–29.—*Cataxia barrettae* sp. nov., male holotype (WAM T135872), pedipalp: 27, retrolateral view; 28, retro-ventral view; 29, prolateral view. Scale bar = 2.0.

nile, same data except track to summit, 34°24′28″S, 117°57′10″E, 15 April 2015, 589 m, M.G. Rix, M.S. Harvey (WAM T135873, DNA_Voucher_169, GB_CO1_ KY485322, GB_CYB_KY485355); 1 ♀ [in fragments following RNA preservation], same data except 34°24′29″S, 117°57′11″E, 14 February 2013, hand collected in montane heathland, 567 m, M.G. Rix, S.E. Harrison (WAM T129357, DNA_Voucher_-CA, GB_CO1_ KY295229, GB_CYB_ KY295356); 1 juvenile, same data (WAM T129358); 1 juvenile, same data (WAM T135352); 1 juvenile [in fragments following RNA preservation], same data (WAM T135353); 1 juvenile, same data except walking track near summit, 34°24′27″S, 117°57′10″E, dug from burrow, 583 m, M.S. Harvey, M.E. Blosfelds, F. Harvey, E. Harvey (WAM T136803); 1 juvenile, Stirling Range National Park, Mount Magog (IBRA_ESP), 34°23′52″S, 117°56′36″E, 14 December 2014, dug from burrow, K. Bain (WAM T135927, DNA_Voucher_170, GB_CO1_KY485323, GB_CYB_KY485356); 1 juvenile, same data except 34°23′59″S, 117°56′35″E, 24 April – 3 September 1996, wet pitfall, J.M. Waldock, B.Y. Main (WAM T42314); 2 ♀, Stirling Range National Park, Mt Magog picnic site (IBRA_ESP), 34°24′32″S, 117°55′12″E, 24 April 1996, M.S. Harvey, J.M. Waldock, B.Y. Main (WAM T132546); 1 ♂, Stirling Range National Park, Mondurup Peak, Site 217 (IBRA_ESP), 34°24′18″S, 117°48′44″E, 16 June 1996, wet pitfall trap, 775 m, S. Barrett (WAM T130329); 1 ♂, same data except Site 218, 34°24′18″S, 117°48′45″E, 770 m (WAM T130331); 1 ♂, same data (WAM T130332); 5 juveniles, same data (WAM T130330); 1 ♀, 1 juvenile, same data (WAM T130333); 1 juvenile, same data except 34°24′11″S, 117°48′47″E, dug from burrow in heathland on summit, 769 m, M.G. Rix, M.S. Harvey, N.J. Tatarnic (WAM T135899, DNA_Voucher_316, GB_CO1_KY485324, GB_CYB_KY485357); 1 juvenile, same data except 34°24′11″S, 117°48′46″E, 770 m (WAM T135904, DNA_Voucher_167, GB_CO1_KY485327, GB_CYB_KY485360); 1 ♀, same data except 34°24′10″S, 117°48′45″E, 779 m (WAM T135902, DNA_Voucher_166, GB_CO1_KY485325, GB_CYB_KY485358); 1 ♀, same data (WAM T135901, DNA_Voucher_165, GB_CO1_KY485326, GB_CYB_KY485359); 1 juvenile, same data (WAM T135903); 1 ♂, "Mount Hassell" (but likely mislabeled; see below), 4 April 1957, A.R. Main (WAM T143031); 1 ♂, same data (WAM T143032).

Etymology.—The specific epithet is named in honor of Sarah Barrett, whose pioneering survey work in high altitude habitats of the Great Southern Region resulted in the colleetion of many important specimens of *Cataxia*, including the only males of this species known from Mondurup Peak.

Diagnosis.—Males of *Cataxia barrettae* can be distinguished from those of *C. bolganupensis*, *C. colesi*, *C. melindae* and *C. sandsorum* by the absence of prolateral clasping spurs on the leg I tibia (Fig. 26; cf. Figs. 47, 48); and from *C. stirlingi* by the longer, more distally pointed RTA (Fig. 27; cf. Fig. 136), and by the more strongly developed macrosetae on the distal prolateral tibia I (Fig. 26; cf. Fig. 135). Females of this species can be distinguished from those of *C. melindae* by the shape of the sternum, which is proportionally longer (Fig. 35; cf. Fig. 101); from *C. bolganupensis* by the less spinose morphology of the leg I tibia (which has no more than 4 porrect, ventral spine-like macrosetae) (Figs. 36, 37; cf. Figs. 58, 59); and from *C. colesi* and *C. sandsorum* by the presence of a sparse field of spinules on the posterior labium (Fig. 34; cf. Figs. 78, 122). By our assessment, females of this species appear to be morphologically indistinguishable from those of *C. stirlingi*.

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group

Figures 30–38.—*Cataxia barrettae* sp. nov., female paratype (WAM T135844): 30–31, carapace and abdomen, dorsal view; 32, cephalothorax, lateral view; 33, eyes, dorsal view; 34, mouthparts, ventral view; 35, cephalothorax, ventral view; 36, leg I, prolateral view; 37, leg I, retrolateral view; 38, spermathecae, dorsal view. Scale bars = 2.0 (30–31, 36–37), 0.5 (38).

by the following 39 unique mitochondrial nucleotide substitutions (based on nine specimens; Fig. 17): ***COI***: G(11), C(49), G(121), G(175), G(181), G(208), C(212), C(238), A(244), C(266), A(316), T(373), C(385), G(458), C(459), G(460), G(481), A(514), C(574), A(619). ***CYB***: C(45), C(120), C(156), G(360), A(363), G(379), G(384), G(399), G(402), T(405), C(453), A(457), G(462), C(552), A(566), C(599), A(600), A(607), C(617).

Description (male holotype).—Total length 16.7. Carapace 6.4 long, 5.2 wide. Abdomen 8.1 long, 5.2 wide. Carapace (Fig. 18) tan (rich red-brown in life; Fig. 6), with black ocular region and darker brown lyra-like pattern on pars cephalica; lateral margins with uniformly-spaced fringe of porreet black setae; fovea straight. Eye group (Fig. 21) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by their own diameter; PME separated by 2.6 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned in line with level of PLE. Maxillae and labium without cuspules (Fig. 22). Abdomen (Fig. 19) oval, dark grey-brown in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view). Dorsal surface of abdomen (Fig.

19) covered with stiff, porrect black setae, each with slightly raised, dark brown sclerotic base; sclerotized sigilla absent. Legs (Figs. 25, 26) variable shades of tan (darker red-brown in life, with contrasting slate-grey femora; Fig. 6), with light scopulae on tarsi I–II; tibia I without clasping spurs but with paired prolateral macrosetae on raised distal protuberance, and adjacent proventral macroseta. Leg I: femur 6.4; patella 2.8; tibia 5.1; metatarsus 5.7; tarsus (slightly damaged) 2.7; total 22.7. Leg I femur–tarsus/carapace length ratio 3.6. Pedipalpal tibia (Figs. 27–29) 1.9 x longer than wide; RTA relatively short, rounded but somewhat conical distally, with dense field of retrolateral spinules; tibia also with long field of smaller spinules extending along curved retroventral edge (distal to base of RTA), these spinules enlarged into a row of eight macrosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 27–29) setose but without field of spinules. Embolus (Figs. 27–29) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

Description (female paratype, WAM T135844).—Total length 22.7. Carapace 7.2 long, 5.5 wide. Abdomen 11.5 long, 6.7 wide. Carapace (Fig. 30) tan, with darker brown pars cephalica and mostly black ocular region; fovea straight. Eye group (Fig. 33) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by slightly more than their own diameter; PME separated by 2.7 x diameter of AME; PME and PLE separated by less than half diameter of AME. PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 34); labium without cuspules but with sparse field of posterior spinules (Fig. 34). Abdomen (Fig. 31) oval, light grey-brown in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 36, 37) variable shades of tan (darker red-brown in life, with contrasting slate-grey femora; Fig. 5); scopulae absent; tibia I with 4 porrect, ventral spine-like macrosetae; metatarsus I and tarsus I with additional rows of prolateral and ventral spine-like macrosetae. Leg I: femur 5.6; patella 3.2; tibia 3.7; metatarsus 3.1; tarsus 2.2; total 17.8. Leg I femur–tarsus/carapace length ratio 2.5. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal scopula. Genitalia (Fig. 38) with pair of anteriorly curved sac-like spermathecae, each composed of internal, sclerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia barrettae* has a highly restricted distribution in the Stirling Range National Park, where it is known only from the summit of Mondurup Peak and from the adjacent Talyuberlup-Magog uplands, on Talyuberlup Peak, Mount Magog and their associated southern slopes and drainage channels (Figs. 14, 15). Two male specimens collected in 1957 and represented only by disarticulated fragments, cited in Main (1985: 47) as being from "Mount Hassell", are likely mislabeled, as this species has never been recorded from the Toolbrunup-Hassell uplands in the intervening 60 years. The habitat is montane heathland (Fig. 13), usually above 500 m (above 770 m on Mondurup Peak), where the spiders are relatively common and locally abundant. This species builds a palisade burrow with a fully open hole and no door, which is usually adorned with a radial skirt of leaves and twigs (Fig. 9). Based on the few specimens that have been collected, males may wander and mate in winter.

Conservation status.—This species has a total (maximum) extent of occurrence of less than 50 km^2, and an actual area of occupancy of significantly less than 10 km^2. Given that the number of well-defined locations at which the species has been found is less than five, and that there is continuing decline in the quality of habitat in the Stirling Range National Park due to *Phytophthora* dieback (Barrett & Yates 2015), climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequency of wildfires, this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

Cataxia bolganupensis (Main, 1985)
(Figs. 1, 16, 39–60)

Neohomogona bolganupensis Main, 1985: 43, figs. 158–164, 169–177, 181–186, 205, 220–222; Main, 1993a: 600.
Cataxia bolganupensis (Main): Raven, 1985: 175; Rix et al., 2017c: 625, figs. 259–260, 264, 270.

Type material.—*Holotype male.* AUSTRALIA: *Western Australia*: Porongurup National Park, track on Nancy Peak, above Bolganup Dam (IBRA_JAF), [34°41′S, 117°52′E], 19 December 1955, hand collected [and molted into maturity April 1956], B.Y. Main (WAM T16395; examined).

Paratypes. AUSTRALIA: *Western Australia*: 1 ♀ (allotype), same data as holotype (WAM T16396); 1 ♀, same data (WAM T16397); 1 ♀, same data (WAM T16398); 1 ♀, same data (WAM T16399); 28 ♀ and/or juveniles, same data (WAM BYM Collection; not recently examined); 1 ♀, same data as holotype except 24 March 1956 (WAM T16401); 11 ♀ and/or juveniles, same data (WAM BYM Collection; not recently examined); 1 ♀, same data as holotype except 6 April 1957 (WAM T16402); 11 ♀ and/or juveniles, same data (WAM BYM Collection; not recently examined); 1 ♀, same data as holotype except 1 July 1957, A.R. Main (WAM T16403); 1 ♀, same data (WAM T16404); 1 ♀, same data (WAM T16405); 1 ♀, same data (WAM T16406); 11 ♀ and/or juveniles, same data (WAM BYM Collection; not recently examined).

Other material examined.—AUSTRALIA: *Western Australia*: 1 ♂, Porongurup National Park, S. end of Millinup Pass (IBRA_JAF), 34°41′43″S, 117°53′51″E, 28 April – 2 September 1996, wet pitfall trap, M.S. Harvey, J.M. Waldock, B.Y. Main (WAM T95754); 1 ♀, same data except 30 March 1993, dug from burrow in karri forest, M.S. Harvey, J.M. Waldock (WAM T29940); 1 ♀, Porongurup National Park, Millinup Pass (IBRA_JAF), 34°41′44″S, 117°54′03″E, 21 April 2015, dug from burrow in karri forest, 286 m, M.G. Rix, M.S. Harvey, N.J. Tatarnic (WAM T135924, DNA_Voucher_184, GB_CO1_KY485335, GB_CYB_KY485368); 1 ♀, same data except 34°41′28″S, 117°54′18″E, 411 m (WAM T135923, DNA_Voucher_183, GB_CO1_KY485336, GB_CYB_KY485369); 1 ♀, same data except 34°41′25″S, 117°54′20″E, 407 m (WAM T135922, DNA_Voucher_182, GB_CO1_KY485337, GB_CYB_KY485370); 1 ♀, same data except 34°41′43″S, 117°54′07″E, 308 m (WAM T135925, DNA_Voucher_185, GB_CO1_KY485334,

GB_CYB_KY485367); 1 juvenile, same data (WAM T135926); 1 ♀, Porongurup National Park, track just E. of Tree-in-the-Rock Day Use Area (IBRA_JAF), 34°40′34″S, 117°52′19″E, 9 October 2013, hand collected in karri forest, M.G. Rix, M.S. Harvey (WAM T131631, DNA_Voucher_34, GB_CO1_ KY295345, GB_CYB_ KY295466); 1 juvenile, Porongurup National Park, Tree-in-the-Rock Day Use Area, Bolganup Road, 34°40′33″S, 117°52′18″E, dug from burrow, 377 m, M.S. Harvey (WAM T117511, DNA_Voucher_186, GB_CO1_KY485333, GB_CYB_KY485366).

Diagnosis.—Males of *Cataxia bolganupensis* can be distinguished from those of *C. barrettae* and *C. stirlingi* by the presence of prolateral clasping spurs on the leg I tibia (Figs. 47, 48; cf. Figs. 26, 135); from *C. sandsorum* by the presence of smoothly rounded carapace margins between the level of coxae II and III (Fig. 39; cf. Fig. 105); from *C. melindae* by the shape of the pedipalpal tibia, which is proportionally longer (Fig. 49; cf. Fig. 93); and from *C. colesi* by the presence of a relatively dense field of spinules on the RTA (with these spinules largely restricted to the antero-dorsal surfaee of the RTA) (Figs. 49, 50; cf. Figs. 71, 72), and by the presence of small and irregularly-arranged spinules on the curved retroventral margin of the palpal tibia (Figs. 49, 50; cf. Figs. 71, 72). Females of this species can be distinguished from those of all other species in the *bolganupensis*-group by the more heavily spinose morphology of tibia I, which has a ventral row of at least 5 porrect, spine-like maerosetae (Figs. 58, 59; cf. Figs. 36, 37, 80, 81, 102, 103, 124, 125, 145, 146).

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group by the following 39 unique mitochondrial nucleotide substitutions (based on six specimens; Fig. 17): ***CO1***: C(13), A(40), T(271), G(469), A(526), T(610). ***CYB***: A(36), G(37), G(48), C(49), A(141), T(169), A(171), C(174), A(196), C(208), C(225), G(231), T(268), G(339), G(363), T(379), A(423), G(426), T(442), G(466), T(502), G(504), C(507), A(511), G(519), A(531), A(558), C(579), G(601), C(616), T(625), T(626), C(663).

Description (male holotype).—Total length 16.4. Carapace 7.4 long, 6.1 wide. Abdomen 6.8 long, 4.4 wide. Carapace (Fig. 39) tan, with mostly black ocular region; lateral margins with uniformly-spaced fringe of porrect black setae; fovea straight, with pronounced posterior pit. Eye group (Fig. 42) rectangular, 0.6 x as long as wide; PLE–PLE/ALE–ALE ratio 1.0; AME separated by slightly less than their own diameter; PME separated by 2.7 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 43); labium without cuspules. Abdomen (Fig. 40) oval, light grey-brown in dorsal view, with beige-grey mottling and beige-grey sigilla spots, the latter forming four faint paired bands posteriorly (in dorsal view). Dorsal surface of abdomen (Fig. 40) covered with stiff, porrect blaek setae, each with slightly raised, dark brown sclerotic base; selerotized sigilla absent. Legs (Figs. 46–48) variable shades of tan, with light scopulae on tarsi I–II; tibia I bearing prolateral clasping spurs. Leg I: femur 7.7; patella 3.5; tibia 6.1; metatarsus 6.7; tarsus 3.8; total 27.8. Leg I femur–tarsus/carapace length ratio 3.7. Pedipalpal tibia (Figs. 49–51) 2.0 x longer than wide; RTA short, rounded, with dense field of spinules largely restricted to antero-dorsal surface; tibia also with irregularly-arranged field of small spinules extending along curved retroventral edge (distal to base of RTA), these spinules enlarged into a cluster of 10 macrosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 49–51) setose but without field of spinules. Embolus (Figs. 49–51) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

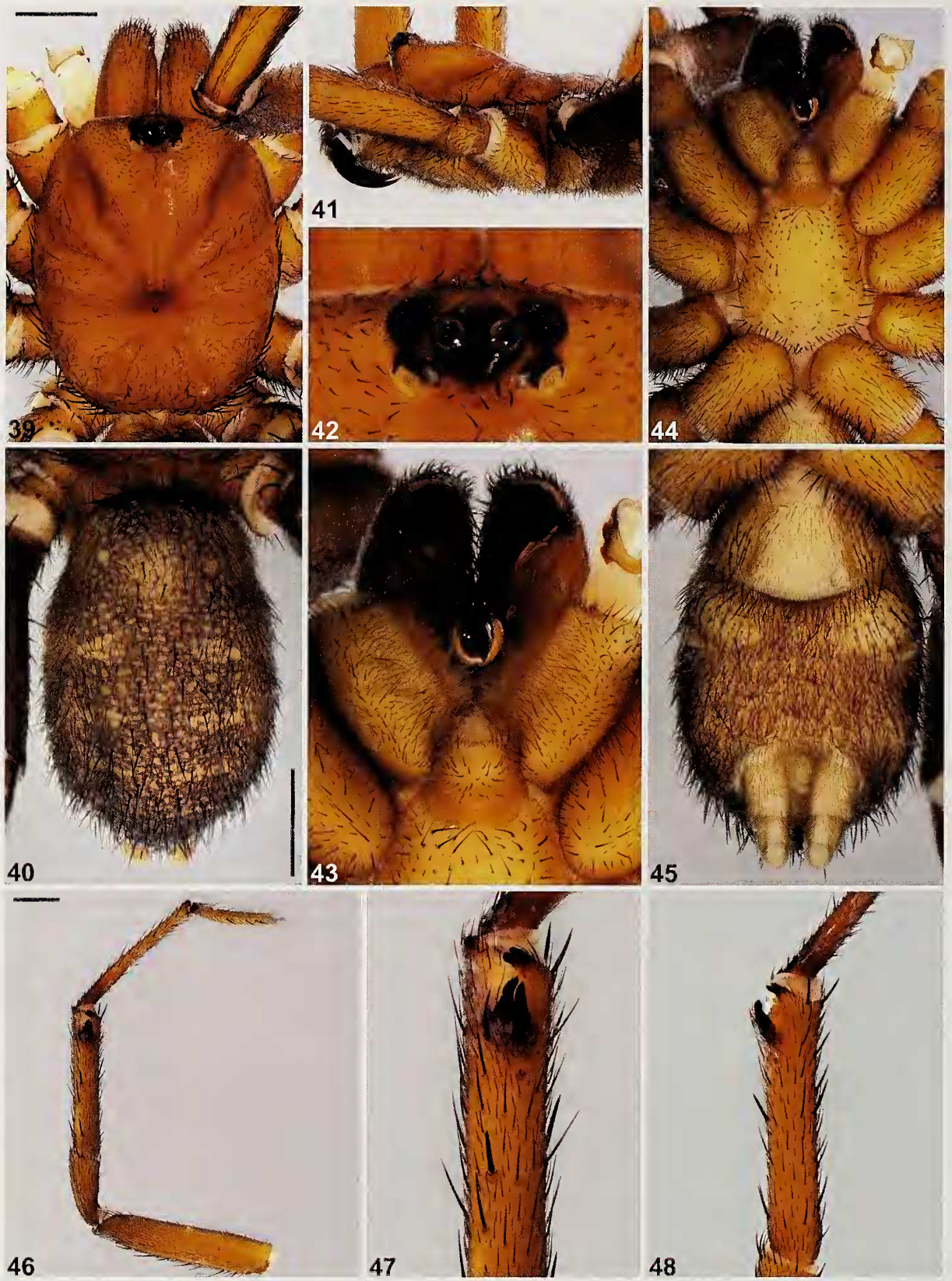
Description (female, WAM T135925).—Total length 25.8. Carapace 8.4 long, 6.7 wide. Abdomen 13.9 long, 8.4 wide. Carapace (Fig. 52) tan, with darker ocular region; fovea straight. Eye group (Fig. 55) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 1.0; AME separated by their own diameter; PME separated by 3.0 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 56); labium without cuspules. Abdomen (Fig. 53) oval, dark grey-brown in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 58–59) variable shades of tan (darker red-brown in life, with contrasting darker femora; Fig. 1); scopulae absent; tibia I with 6 porrect, ventral spine-like macrosetae; metatarsus I and tarsus I with additional rows of prolateral and ventral spine-like maerosetae. Leg I: femur 6.3; patella 3.7; tibia 3.9; metatarsus 3.6; tarsus 2.3; total 19.9. Leg I femur–tarsus/carapace length ratio 2.4. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal seopula. Genitalia (Fig. 60) with pair of anteriorly curved sac-like spermathecae, eaeh composed of internal, sclerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia bolganupensis* has a highly restricted distribution in the Porongurup National Park, north of Albany (Figs. 10, 14, 16), where it can be found in wet karri forest on the southern side of the range. It is currently known only from the Millinup Pass and Bolganup Creek areas, but is usually locally abundant and may be found in other small pockets of the park. This species builds a palisade burrow with a fully open hole and no door, whieh is usually adorned with a radial skirt of leaves and twigs. Based on the few specimens that have been collected, males probably wander and mate in late autumn or winter.

Conservation status.—This species has a total (maximum) extent of occurrence of less than 50 km^2, and an actual area of oecupancy of less than 10 km^2. Given that the number of well-defined locations at which the species has been found is less than five, and that there is continuing deeline in the quality of habitat in the Porongurup National Park due to climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequency of wildfires (e.g. as in 2007), this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

Cataxia colesi Rix, Bain, Main & Harvey, sp. nov.
http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:0101F8D7-2E72-4803-A354-267BB85D20A2
(Figs. 2, 15, 61–82)

Type material.—*Holotype male.* AUSTRALIA: *Western Australia*: Stirling Range National Park, Toolbrunup Peak, Site 228 (IBRA_ESP), 34°23′11″S, 118°02′48″E, 2 September 1995, pitfall trap, 800 m, S. Barrett (WAM T32557).



Figures 39–48.—*Cataxia bolganupensis* (Main, 1985), male holotype (WAM T16395), somatic morphology: 39–40, carapace and abdomen, dorsal view; 41, cephalothorax, lateral view; 42, eyes, dorsal view; 43, mouthparts, ventral view; 44–45, cephalothorax and abdomen, ventral view; 46, leg I, prolateral view; 47, leg I tibia, clasping spurs, prolateral view; 48, leg I tibia, pro-ventral view. Scale bars = 2.0.

Figures 49–51.—*Cataxia bolganupensis* (Main, 1985) , male holotype (WAM T16395), pedipalp: 49, retrolateral view; 50, retro-ventral view; 51, prolateral view. Scale bar = 2.0.

Paratype. AUSTRALIA: *Western Australia*: 1 ♀, Stirling Range National Park, Toolbrunup Peak, track to summit (IBRA_ESP), 34°23′11″S, 118°03′00″E, 19 April 2015, dug from burrow in mesic gully, 751 m, A. Coles, M.G. Rix, M.S. Harvey, N.J. Tatarnic (WAM T135917, DNA_Voucher_172, GB_CO1_KY485345, GB_CYB_KY485378).

Other material examined.—AUSTRALIA: *Western Australia*: 1 ♀, Stirling Range National Park, Toolbrunup Peak, track to summit (IBRA_ESP), 34°23′11″S, 118°03′00″E, 19 April 2015, dug from burrow in mesic gully, 751 m, A. Coles, M.G. Rix, M.S. Harvey, N.J. Tatarnic (WAM T135919, DNA_Voucher_174, GB_CO1_KY485346, GB_CYB_KY485379); 1 juvenile, same data (WAM T135920, DNA_Voucher_175, GB_CO1_KY485344, GB_CYB_KY485377); 1 ♀, same data (WAM T135918, DNA_Voucher_173, GB_CO1_KY485347, GB_CYB_KY485380); 1 ♀, Stirling Range National Park, Toolbrunup Peak, near summit (IBRA_ESP), 34°23′02″S, 118°02′55″E, hand collected, 964 m, M.G. Rix (WAM T131646); 1 ♀, Stirling Range National Park, saddle between Mount Hassell and Toolbrunup Peak (IBRA_ESP), 34°22′50″S, 118°04′15″E, 14 December 2014, dug from burrow, K. Bain (WAM T135930, DNA_Voucher_176, GB_CO1_KY485343, GB_CYB_KY485376).

Etymology.—The specific epithet is named in honor of Alec Coles, eurrently CEO of the Western Australian Museum, whose collecting prowess helped secure some of the specimens used in this study.

Diagnosis.—Males of *Cataxia colesi* can be distinguished from those of *C. barrettae* and *C. stirlingi* by the presence of prolateral clasping spurs on the leg I tibia (Figs. 69, 70; cf. Figs. 26, 135); from *C. sandsorum* by the presence of smoothly rounded carapace margins between the level of coxae II and III (Fig. 61; cf. Fig. 105); from *C. melindae* by the shape of the pedipalpal tibia, which is proportionally longer (Fig. 71; cf. Fig. 93); and from *C. bolganupensis* by the presenee of a relatively sparse field of spinules on the RTA (with these spinules extending onto the retrolateral surface of the RTA) (Figs. 71, 72; cf. Figs. 49, 50), and by the presence of larger and more uniformly-arranged spinules on the curved retro-ventral margin of the palpal tibia (Figs. 71, 72; cf. Figs. 49, 50). Females of this species can be distinguished from those of *C. melindae* by the shape of the sternum, which is proportionally longer (Fig. 79; cf. Fig. 101); from *C. bolganupensis* by the less spinose morphology of the leg I tibia (which has no more than 4 porrect, ventral spine-like macrosetae) (Figs. 80, 81; cf. Figs. 58, 59); from *C. barrettae* and *C. stirlingi* by the absence of a field of spinules on the posterior labium (Fig. 78; cf. Figs. 34, 143); and from *C. sandsorum* by the lower profile of the pars cephalica (Fig. 76; cf. Fig. 120), and by the shape of the posterior eye row, which is as wide as or wider than the anterior eye row (Fig. 77; cf. Fig. 121).

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group by the following 20 unique mitochondrial nucleotide substitutions (based on five specimens; Fig. 17): ***CO1***: T(40), T(100), A(148), C(172), G(271), A(289), T(316), T(412), T(482), C(628). ***CYB***: T(111), C(254), A(291), G(468), T(522), C(546), G(555), G(580), G(598), T(624).

Description (male holotype).—Total length 14.9. Carapace 6.3 long, 5.2 wide. Abdomen 6.7 long, 5.2 wide. Carapace (Fig. 61) dark tan, with black ocular region and darker brown lyra-like pattern on pars cephalica; lateral margins with uniformly-spaced fringe of porrect black setae; fovea straight. Eye group (Fig. 64) rectangular, 0.6 x as long as wide; PLE–

Figures 52–60.—*Cataxia bolganupensis* (Main, 1985), female (WAM T135925): 52–53, carapace and abdomen, dorsal view; 54, cephalothorax, lateral view; 55, eyes, dorsal view; 56, mouthparts, ventral view; 57, cephalothorax, ventral view; 58, leg I, prolateral view; 59, leg I, retrolateral view; 60, spermatheeae, dorsal view. Scale bars = 2.0 (52–53, 58–59), 0.5 (60).

PLE/ALE–ALE ratio 1.0; AME separated by their own diameter; PME separated by 2.6 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 65); labium without cuspules. Abdomen (Fig. 62) oval, grey in dorsal view, with beige-brown mottling and beige-brown sigilla spots, the latter forming very faint paired bands posteriorly (in dorsal view). Dorsal surface of abdomen (Fig. 62) covered with stiff, porrect black setae, each with slightly raised, dark brown sclerotic base; sclerotized sigilla absent. Legs (Figs. 68–70) variable shades of tan, with light scopulae on tarsi I–II; tibia I bearing prolateral clasping spurs. Leg I: femur 6.9; patella 3.1; tibia 5.4; metatarsus 6.8; tarsus 3.7; total 25.8. Leg I femur–tarsus/carapace length ratio 4.1. Pedipalpal tibia (Figs. 71–73) 2.0 x longer than wide; RTA short, rounded, with relatively sparse field of large retrolateral spinules; tibia also with long field of large, uniformly-arranged spinules extending along curved retroventral edge (distal to base of RTA), these spinules slightly enlarged into a cluster of three macrosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 71–73) setose but without field of spinules.

Figures 61–70.—*Cataxia colesi* sp. nov., male holotype (WAM T32557), somatic morphology: 61–62, carapace and abdomen, dorsal view; 63, cephalothorax, lateral view; 64, eyes, dorsal view; 65, mouthparts, ventral view; 66–67, cephalothorax and abdomen, ventral view; 68, leg I, prolateral view; 69, leg I tibia, clasping spurs, prolateral view; 70, leg I tibia, pro-ventral view. Scale bars = 2.0.

Figures 71–73.—*Cataxia colesi* sp. nov., male holotype (WAM T32557), pedipalp: 71, retrolateral view; 72, retro-ventral view; 73, prolateral view. Scale bar = 2.0.

Embolus (Figs. 71–73) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

Description (female paratype, WAM T135917).—Total length 28.2. Carapace 9.4 long, 7.2 wide. Abdomen 14.5 long, 8.7 wide. Carapace (Fig. 74) dark tan-brown, with darker pars cephalica and mostly black ocular region; fovea straight. Eye group (Fig. 77) rectangular, 0.6 x as long as wide; PLE–PLE/ALE–ALE ratio 1.0; AME separated by their own diameter; PME separated by 3.0 x diameter of AME; PME and PLE separated by slightly more than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 78); labium without cuspules. Abdomen (Fig. 75) oval, dark grey in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 80–81) variable shades of tan (darker red-brown in life, with contrasting darker femora; Fig. 2); scopulae absent; tibia I with 3 porrect, ventral spine-like macrosetae; metatarsus I and tarsus I with additional rows of prolateral and ventral spine-like macrosetae. Leg I: femur 7.0; patella 4.0; tibia 4.3; metatarsus 3.7; tarsus 2.3; total 21.3. Leg I femur–tarsus/carapace length ratio 2.3. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal scopula. Genitalia (Fig. 82) with pair of obliquely directed bulbous spermathecae, each composed of internal, sclerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia colesi* is the largest species in the *bolganupensis*-group, and has a highly restricted distribution in the Stirling Range National Park, where it is known only from the Toolbrunup-Hassell uplands, on Toolbrunup Peak, Mount Hassell, and the saddle between the two peaks (Figs. 10, 14, 15). It is usually found in heavily shaded, mesic habitats above 500 m altitude (Fig. 11), and while patchily distributed can be locally abundant. This species builds a short palisade burrow with a fully open hole and no door, which is usually adorned with leaves and twigs. Based on the single male specimen that has been collected, males may wander in spring.

Conservation status.—This species has a total (maximum) extent of occurrence and area of occupancy each of significantly less than 10 km^2. Given that the number of well-defined locations at which the species has been found is less than five, and that there is continuing decline in the quality of habitat in the Stirling Range National Park due to *Phytophthora* diebaek (Barrett & Yates 2015), climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequency of wildfires, this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

Cataxia melindae Rix, Bain, Main & Harvey, sp. nov.
http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:A69A716F-C769-4343-9411-8E4F4E25C345
(Figs. 16, 83–104)

Type material.—*Holotype male.* AUSTRALIA: *Western Australia*: Mount Manypeaks Nature Reserve, Mount Manypeaks, Site 202 (IBRA_ESP), 34°53′40″S, 118°16′02″E, 3 May 1996, wet pitfall, S. Barrett (WAM T132544).

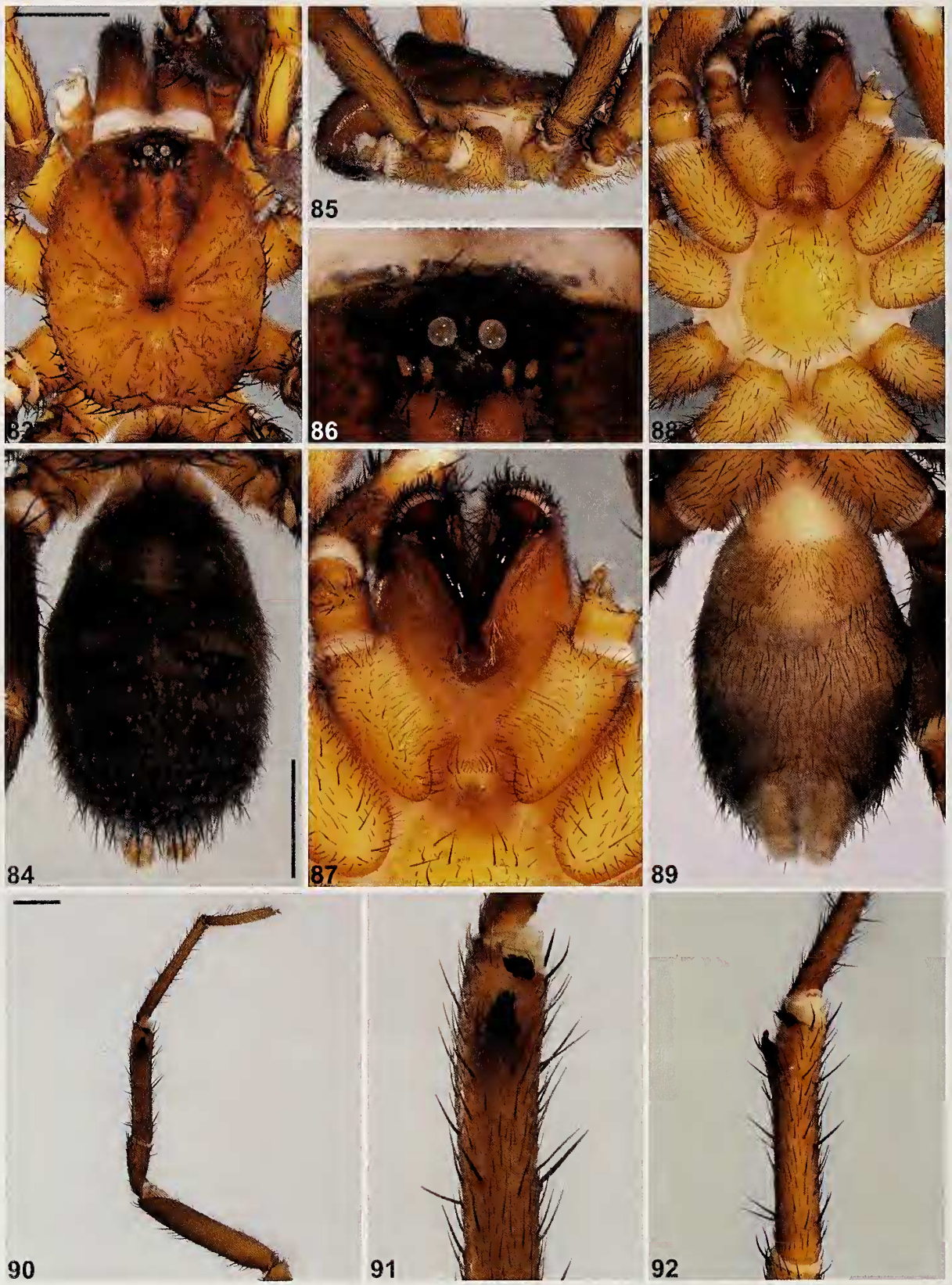
Paratypes. AUSTRALIA: *Western Australia*: 1 ♂, Mount Manypeaks Nature Reserve, Mount Manypeaks, Site 201 (IBRA_ESP), 34°53′40″S, 118°16′01″E, 3 May 1996, wet pitfall, S. Barrett (WAM T132545); 1 ♀, Mount Manypeaks Nature Reserve, Mount Manypeaks, Site 3 (IBRA_ESP), 34°53′48″S, 118°17′58″E, 26 October 2006, hand collected from burrow in

Figures 74–82.—*Cataxia colesi* sp. nov., female paratype (WAM T135917): 74–75, carapace and abdomen, dorsal view; 76, cephalothorax, lateral view; 77, eyes, dorsal view; 78, mouthparts, ventral view; 79, cephalothorax, ventral view; 80, leg I, prolateral view; 81, leg I, retrolateral view; 82, spermathecae, dorsal view. Scale bars = 2.0 (74–75, 80–81), 0.5 (82).

gully, M.L. Moir, A. Sampey (WAM T78521, DNA_Voucher_315, GB_CO1_KY485348, GB_CYB_KY485381).

Other material examined.—AUSTRALIA: *Western Australia*: 1 juvenile, Mount Manypeaks Nature Reserve, Mount Manypeaks, near summit, Site 5, 34°53′49″S, 118°15′57″E, 1 December 2006, hand collected from burrow in gully, M.L. Moir, K.E.C. Brennan, B. Atkinson (WAM T78561, DNA_Voucher_163, GB_CO1_KY485350, GB_CYB_KY485383); 1 ♀, same data (WAM T78559, DNA_Voucher_162, GB_CO1_KY485351, GB_CYB_KY485384); 1 juvenile, same data (WAM T78562, DNA_Voucher_164, GB_CO1_KY485349, GB_CYB_KY485382); 1 juvenile, same data (WAM T78560); 1 juvenile, same data (WAM T78563); 1 juvenile, same data (WAM T78784); 1 ♀, same data except Site 6, 34°53′57″S, 118°15′43″E, hand collected from burrow (WAM T78557, DNA_Voucher_161, GB_CO1_KY485352, GB_CYB_KY485385).

Etymology.—The specific epithet is named in honor of Melinda Moir, whose dedicated survey work in the Mount Manypeaks Nature Reserve resulted in the collection of many important specimens of *Cataxia*, including the molecular exemplar specimens analyzed in this study.



Figures 83–92.—*Cataxia melindae* sp. nov., male holotype (WAM T132544), somatic morphology: 83–84, carapace and abdomen, dorsal view; 85, cephalothorax, lateral view; 86, eyes, dorsal view; 87, mouthparts, ventral view; 88–89, cephalothorax and abdomen, ventral view; 90, leg I, prolateral view; 91, leg I tibia, clasping spurs, prolateral view; 92, leg I tibia, pro-ventral view. Scale bars = 2.0.

Figures 93–95.—*Cataxia melindae* sp. nov., male holotype (WAM T132544), pedipalp: 93, retrolateral view; 94, retro-ventral view; 95, prolateral view. Scale bar = 2.0.

Diagnosis.—Males of *Cataxia melindae* can be distinguished from those of *C. barrettae* and *C. stirlingi* by the presence of prolateral clasping spurs on the leg I tibia (Figs. 91, 92; cf. Figs. 26, 135); from *C. sandsorum* by the presence of smoothly rounded carapace margins between the level of coxae II and III (Fig. 83; ef. Fig. 105); and from *C. bolganupensis* and *C. colesi* by the shape of the pedipalpal tibia, which is proportionally shorter and stouter (Fig. 93; ef. Figs. 49, 71). Females of this species can be distinguished from those of all other species in the *bolganupensis*-group by the shape of the sternum, which is short, sub-circular or subquadrate and almost as wide as long (Fig. 101; cf. Figs. 35, 57, 79, 123, 144).

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group by the following 37 unique mitochondrial nucleotide substitutions (based on five specimens; Fig. 17): ***COI***: C(31), C(85), A(94), G(133), C(178), A(184), T(364), A(391), G(415), C(445), G(474), G(483), A(496), T(631). ***CYB***: T(37), C(48), A(60), C(69), C(83), A(132), C(177), G(204), C(270), C(348), G(372), A(387), G(393), T(435), C(450), C(486), A(489), A(498), T(520), C(522), G(573), G(582), T(594).

Description (male holotype).—Total length 14.2. Carapace 5.9 long, 4.7 wide. Abdomen 6.0 long, 3.8 wide. Carapace (Fig. 83) tan, with mostly black ocular region and darker brown lyra-like pattern on pars cephalica; lateral margins with uniformly-spaced fringe of porrect black setae; fovea straight. Eye group (Fig. 86) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by slightly less than their own diameter; PME separated by 2.3 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned in line with level of PLE. Maxillae and labium without cuspules (Fig. 87). Abdomen (Fig. 84) oval, dark grey-brown in dorsal view, with dark beige-brown mottling and dark beige-brown sigilla spots, the latter forming four paired bands posteriorly. Dorsal surface of abdomen (Fig. 84) covered with stiff, porrect black setae, each with slightly raised, dark brown sclerotic base; sclerotized sigilla absent. Legs (Figs. 90–92) variable shades of tan, with light scopulae on tarsi I–II; tibia I bearing prolateral clasping spurs. Leg I: femur 6.2; patella 2.6; tibia 4.8; metatarsus 5.5; tarsus 3.0; total 22.0. Leg I femur–tarsus/carapace length ratio 3.8. Pedipalpal tibia (Figs. 93–95) stout, 1.7 x longer than wide; RTA short, rounded, with relatively sparse field of retrolateral spinules; tibia also with irregularly-arranged field of small spinules extending along curved retroventral edge (distal to base of RTA), these spinules enlarged into a row of 10 macrosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 93–95) setose but without field of spinules. Embolus (Figs. 93–95) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

Description (female paratype, WAM T78521).—Total length 19.1. Carapace 6.6 long, 5.0 wide. Abdomen 9.8 long, 5.8 wide. Carapace (Fig. 96) dark tan-brown, with darker pars cephalica and mostly black ocular region; fovea straight. Eye group (Fig. 99) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by their own diameter; PME separated by 3.0 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 100); labium without cuspules. Abdomen (Fig. 97) oval, dark grey-brown in dorsal view, darker posteriorly, with beige-brown mottling and prominent beige-grey sigilla spots, the latter forming three paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 102–103) variable shades of tan; scopulae absent; tibia I with 3 porrect, ventral spine-like macrosetae; metatarsus I and

Figures 96–104.—*Cataxia melindae* sp. nov., female paratype (WAM T78521): 96–97, carapace and abdomen, dorsal view; 98, cephalothorax, lateral view; 99, eyes, dorsal view; 100, mouthparts, ventral view; 101, cephalothorax, ventral view; 102, leg I, prolateral view; 103, leg I, retrolateral view; 104, spermathecae, dorsal view. Scale bars = 2.0 (96–97, 102–103), 0.5 (104).

tarsus I with additional rows of prolateral and ventral spine-like macrosetae. Leg I: femur 4.6; patella 2.7; tibia 3.2; metatarsus 2.6; tarsus 1.7; total 14.8. Leg I femur–tarsus/carapace length ratio 2.2. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal scopula. Genitalia (Fig. 104) with pair of short, anteriorly curved and slightly bulbous spermathecae, each composed of internal, sclerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia melindae* has a highly restricted distribution in the Mount Manypeaks Nature Reserve, east of Albany, where it is known only from near the summit and south-eastern slopes of Mount Manypeaks (Figs. 10, 14, 16). The preferred habitat seems to be mesic gullies in dense heathland. Little else is known of the biology of this species, although based on the few specimens that have been collected, males probably wander and mate in late autumn.

Conservation status.—This species has a total (maximum) extent of occurrence and area of occupancy each of less than 10 km^2. Given that the number of well-defined locations at which the species has been found is less than five, and that there is continuing decline in the quality of habitat in the Mount Manypeaks Nature Reserve due to *Phytophthora* dieback,

climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequency of wildfires, this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

Cataxia sandsorum Rix, Bain, Main & Harvey, sp. nov.
http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:C24909E5-1B79-487D-AD34-357C69660DCA
(Figs. 3, 8, 15, 105–126)

Type material.—*Holotype male*. AUSTRALIA: *Western Australia*: Stirling Range National Park, S. face of Pyungoorup Peak (IBRA_ESP), 34°22′17″S, 118°19′20″E, 4 September – 18 December 1996, wet pitfall trap, M.S. Harvey, J.M. Waldock, B.Y. Main (WAM T42313).

Paratype. AUSTRALIA: *Western Australia*: 1 ♀, same data as holotype except 18 December 1996, hand collected, B.Y. Main (WAM T38922).

Other material examined.—AUSTRALIA: *Western Australia*: 2 ♀, Stirling Range National Park, S. face of Pyungoorup Peak (IBRA_ESP), 34°22′17″S, 118°19′20″E, 27 April 1996, 330 m, M.S. Harvey, J.M. Waldock, B.Y. Main (WAM T132547); 1 ♀, Stirling Range National Park, gully at S. face of Pyungoorup Peak (IBRA_ESP), 34°21′54″S, 118°19′43″E, 16 April 2015, dug from burrow in mesic gully, 425 m, M.G. Rix, M.S. Harvey (WAM T135887, DNA_Voueher_177, GB_CO1_KY485342, GB_CYB_KY485375); 1 juvenile, same data (WAM T135880, DNA_Voueher_180, GB_CO1_KY485339, GB_CYB_KY485372); 1 juvenile, same data (WAM T135881, DNA_Voucher_181, GB_CO1_KY485338, GB_CYB_KY485371); 1 juvenile, same data (WAM T135879); 1 ♀, same data except 34°22′00″S, 118°19′43″E, 371 m (WAM T135877, DNA_Voucher_178, GB_CO1_KY485341, GB_CYB_KY485374); 1 juvenile, same data except 34°21′57″S, 118°19′43″E, 380 m (WAM T135878, DNA_Voucher_179, GB_CO1_KY485340, GB_CYB_KY485373); 1 ♀, Stirling Range National Park, base of Pyungoorup Peak (IBRA_ESP), 34°22′11″S, 118°19′34″E, 5 August 2008, hand collected, M.G. Rix, M.S. Harvey (WAM T131647); 1 juvenile, same data (WAM T131649); 1 ♀, same data except 34°21′54″S, 118°19′44″E (WAM T131648).

Etymology.—The specific epithet is named in honor of Ayleen and Tony Sands, for their wonderful hospitality and for their dedication to preserving and promoting the biodiversity of the Stirling Range National Park.

Diagnosis.—Males of *Cataxia sandsorum* can be distinguished from those of all other species in the *bolganupensis*-group by the presenee of a sharp indentation on each side of the carapace, between the level of coxae II and III (Fig. 105; cf. Figs. 18, 39, 61, 83, 127), and by the presence of a pair of deep concave depressions on each cheliceral paturon (Fig. 107; cf. Figs. 63, 129). Females of this species can be distinguished from those of *C. melindae* by the shape of the sternum, which is proportionally longer (Fig. 123; cf. Fig. 101); from *C. bolganupensis* by the less spinose morphology of the leg I tibia (whieh has no more than 4 porrect, ventral spine-like macrosetae) (Figs. 124, 125; cf. Figs. 58, 59); from *C. barrettae* and *C. stirlingi* by the absence of a field of spinules on the posterior labium (Fig. 122; cf. Figs. 34, 143); and from *C. colesi* by the higher profile of the pars cephalica (Fig. 120; cf. Fig. 76), and by the shape of the anterior eye row, which is marginally wider than the posterior eye row (Fig. 121; cf. Fig. 77).

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group by the following 28 unique mitochondrial nucleotide substitutions (based on five specimens; Fig. 17): ***CO1***: A(46), G(49), C(202), T(217), C(232), A(295), G(424), A(451), C(508), A(517), C(533), G(574), A(628). ***CYB***: C(82), T(83), C(162), A(186), T(234), C(244), A(300), C(345), C(354), T(376), T(377), A(402), T(426), C(493), C(519).

Description (male holotype).—Total length 15.6. Carapace 6.4 long, 4.8 wide. Abdomen 6.4 long, 3.9 wide. Carapace (Fig. 105) tan, with darker ocular region and darker brown lyra-like pattern on pars cephalica; lateral margins sharply indented between level of coxae II and III, with uniformly-spaced fringe of porrect black setae; fovea straight. Eye group (Fig. 108) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by slightly less than their own diameter; PME separated by 2.4 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned in line with level of PLE. Maxillae and labium without cuspules (Fig. 109). Abdomen (Fig. 106) oval, light grey in dorsal view, with beige-grey mottling and beige-grey sigilla spots, the latter forming four paired bands posteriorly. Dorsal surface of abdomen (Fig. 106) covered with stiff, porrect black setae, each with slightly raised, dark brown sclerotie base; sclerotized sigilla absent. Legs (Figs. 112–114) variable shades of tan, with light scopulae on tarsi I–II; tibia I bearing prolateral clasping spurs. Leg I: femur 6.8; patella 3.0; tibia 5.3; metatarsus 5.9; tarsus 3.0; total 24.1. Leg I femur–tarsus/carapace length ratio 3.8. Pedipalpal tibia (Figs. 115–117) 2.0 x longer than wide; RTA short, rounded, with dense field of retrolateral spinules; tibia also with long field of spinules of varying sizes extending along curved retroventral edge (distal to base of RTA), these spinules enlarged into a divided cluster of nine macrosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 115–117) setose but without field of spinules. Embolus (Figs. 115–117) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

Description (female paratype, WAM T38922).—Total length 21.3. Carapace 7.0 long, 5.4 wide. Abdomen 10.6 long, 6.4 wide. Carapace (Fig. 118) dark tan, with darker pars cephalica and mostly black ocular region; fovea straight. Eye group (Fig. 121) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by their own diameter; PME separated by 3.0 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 122); labium without cuspules. Abdomen (Fig. 119) oval, grey in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 124, 125) variable shades of tan (darker red-brown in life, with contrasting darker femora; Fig. 3); scopulae absent; tibia I with 3 porrect, ventral spine-like macrosetae; metatarsus I and tarsus I with additional rows of prolateral and ventral spine-like macrosetae. Leg I: femur 5.5; patella 3.4; tibia 3.7; metatarsus 3.3; tarsus 2.2; total 18.1. Leg I femur–tarsus/carapace length ratio 2.6. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal scopula. Genitalia (Fig. 126) with pair of anteriorly

Figures 105–114.—*Cataxia sandsorum* sp. nov., male holotype (WAM T42313), somatic morphology: 105–106, carapace and abdomen, dorsal view; 107, cephalothorax, lateral view; 108, eyes, dorsal view; 109, mouthparts, ventral view; 110–111, cephalothorax and abdomen, ventral view; 112, leg 1, prolateral view; 113, leg I tibia, clasping spurs, prolateral view; 114, leg I tibia, pro-ventral view. Scale bars = 2.0.

Figures 115–117.—*Cataxia sandsorum* sp. nov., male holotype (WAM T42313), pedipalp: 115, retrolateral view; 116, retro-ventral view; 117, prolateral view. Scale bar = 2.0.

eurved sac-like spermathecae, each composed of internal, selerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia sandsorum* has a highly restricted distribution in the Stirling Range National Park, where it is known only from the eastern side of the eastern massif, in the vicinity of Pyungoorup Peak and adjacent Ellen Peak (Figs. 10, 14–15). The habitat at the type locality is upland riparian (mesic) eucalypt forest on the heavily shaded southern side of the range (Fig. 12), where the spiders are locally abundant. Its distribution elosely abuts that of *C. stirlingi* (Fig. 15), although the two species have never found in direct sympatry. *Cataxia sandsorum* builds a palisade burrow with a fully open hole and no door, which is usually adorned with a radial skirt of leaves and twigs (Fig. 8). Based on the single male specimen that has been collected, males may wander and mate in spring.

Conservation status.—This species has a total (maximum) extent of occurrence and area of occupancy each of significantly less than 10 km^2. Given that this species has only been found at just a single well-defined location, and that there is continuing decline in the quality of habitat in the eastern Stirling Range National Park due to severe *Phytophthora* dieback (Barrett & Yates 2015), climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequeney of wildfires, this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

Cataxia stirlingi (Main, 1985)
(Figs. 4, 7, 15, 127–147)

Neohomogona stirlingi Main, 1985: 43, figs. 165–168, 178–180, 206–207, 219; Main, 1993a: 600.
Cataxia stirlingi (Main): Raven, 1985: 175.

Type material.—*Holotype male.* AUSTRALIA: *Western Australia*: Stirling Range National Park, south base of Bluff Knoll (IBRA_ESP), [34°23′S, 118°15′E], 5 April 1957, hand collected, A.R. Main (WAM T16407; examined).

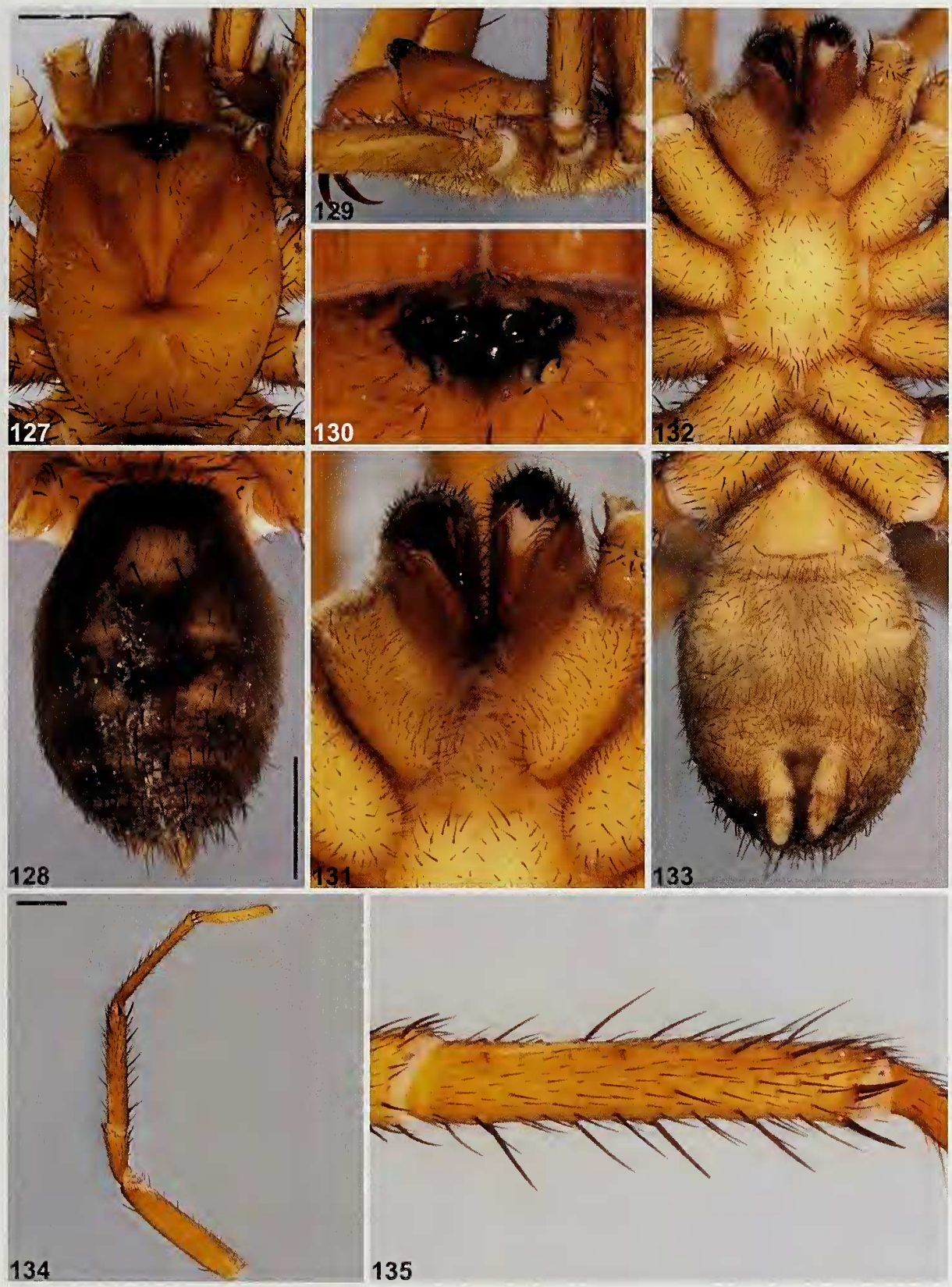
Paratypes. AUSTRALIA: *Western Australia*: 1 ♀ (allotype), same data as holotype except 10 June 1954, B.Y. Main (WAM T16408); 1 ♀, same data (WAM T16410); 1 ♀, same data as holotype (WAM T16400); 1 ♀, same data (WAM T16411); 14 ♀ and/or juveniles, same data (WAM BYM Collection; not recently examined); 1 ♂, same data (molted to maturity before 14 May 1958) (WAM BYM Collection; not recently examined); 1 ♀, same data as holotype except 8 June 1954, B.Y. Main (WAM T16409); 21 ♀, 26 juveniles, same data (WAM BYM Collection; not recently examined).

Other material examined.—AUSTRALIA: *Western Australia*: 1 ♀, Stirling Range National Park, Bluff Knoll, track to summit (IBRA_ESP), 34°22′09″S, 118°14′52″E, 15 April 2015, dug from burrow, 494 m, M.G. Rix, M.S. Harvey, N.J. Tatarnic, A. Coles (WAM T135850, DNA_Voucher_190, GB_CO1_KY485331, GB_CYB_KY485364); 1 juvenile, same data except 34°22′09″S, 118°14′48″E, 492 m (WAM T135847, DNA_Voucher_187, GB_CO1_KY485332, GB_CYB_KY485365); 1 ♀, same data except 34°22′35″S, 118°15′02″E, 758 m (WAM T135848, DNA_Voucher_188, GB_CO1_KY485330, GB_CYB_KY485363); 1 juvenile, same data (WAM T135849, DNA_Voucher_189, GB_CO1_KY485329, GB_CYB_KY485362); 1 ♀, Stirling Range National Park, gully on Ellen Track near Moongoongoonderup Creek (IBRA_ESP), [34°23′S, 118°17′E], 27 April 1996, hand collected, B.Y. Main, M.S. Harvey, J.M. Waldock (WAM T44291); 1 ♀, Stirling Range National Park, Moongoongoonderup Hill (IBRA_ESP), 34°21′46″S, 118°15′52″E, 15 December 2014, dug from burrow, K. Bain

Figures 118–126.—*Cataxia sandsorum* sp. nov., female paratype (WAM T38922): 118–119, carapace and abdomen, dorsal view; 120, cephalothorax, lateral view; 121, eyes, dorsal view; 122, mouthparts, ventral view; 123, cephalothorax, ventral view; 124, leg I, prolateral view; 125, leg I, retrolateral view; 126, spermathecae, dorsal view. Scale bars = 2.0 (118–119, 124–125), 0.5 (126).

(WAM T135929, DNA_Voucher_191, GB_CO1_KY485328, GB_CYB_KY485361); 1 juvenile (tenuously identified; see below), Stirling Range National Park, near W. end of Ellen Track (IBRA_ESP), 34°23′04″S, 118°17′17″E, 30 April – 4 September 1996, wet pitfall, M.S. Harvey et al. (WAM T42330).

Diagnosis.—Males of *Cataxia stirlingi* can be distinguished from those of *C. bolganupensis*, *C. colesi*, *C. melindae* and *C. sandsorum* by the absence of prolateral clasping spurs on the leg I tibia (Fig. 135; cf. Figs. 47, 48); and from *C. barrettae* by the shorter, more distally rounded shape of the RTA (Fig. 136; cf. Fig. 27), and by the less strongly developed macrosetae on the distal prolateral tibia I (Fig. 135; cf. Fig. 26). Females of this species can be distinguished from those of *C. melindae* by the shape of the sternum, which is proportionally longer (Fig. 144; cf. Fig. 101); from *C. bolganupensis* by the less spinose leg I tibia (with no more than 4 porrect, ventral spine-like macrosetae) (Figs. 145, 146; cf. Figs. 58, 59); and from *C. colesi* and *C. sandsorum* by the presence of a sparse field of spinules on the posterior labium (Fig. 143; cf. Figs. 78, 122). By our assessment, females of this species appear to be morphologically indistinguishable from those of *C. barrettae*.



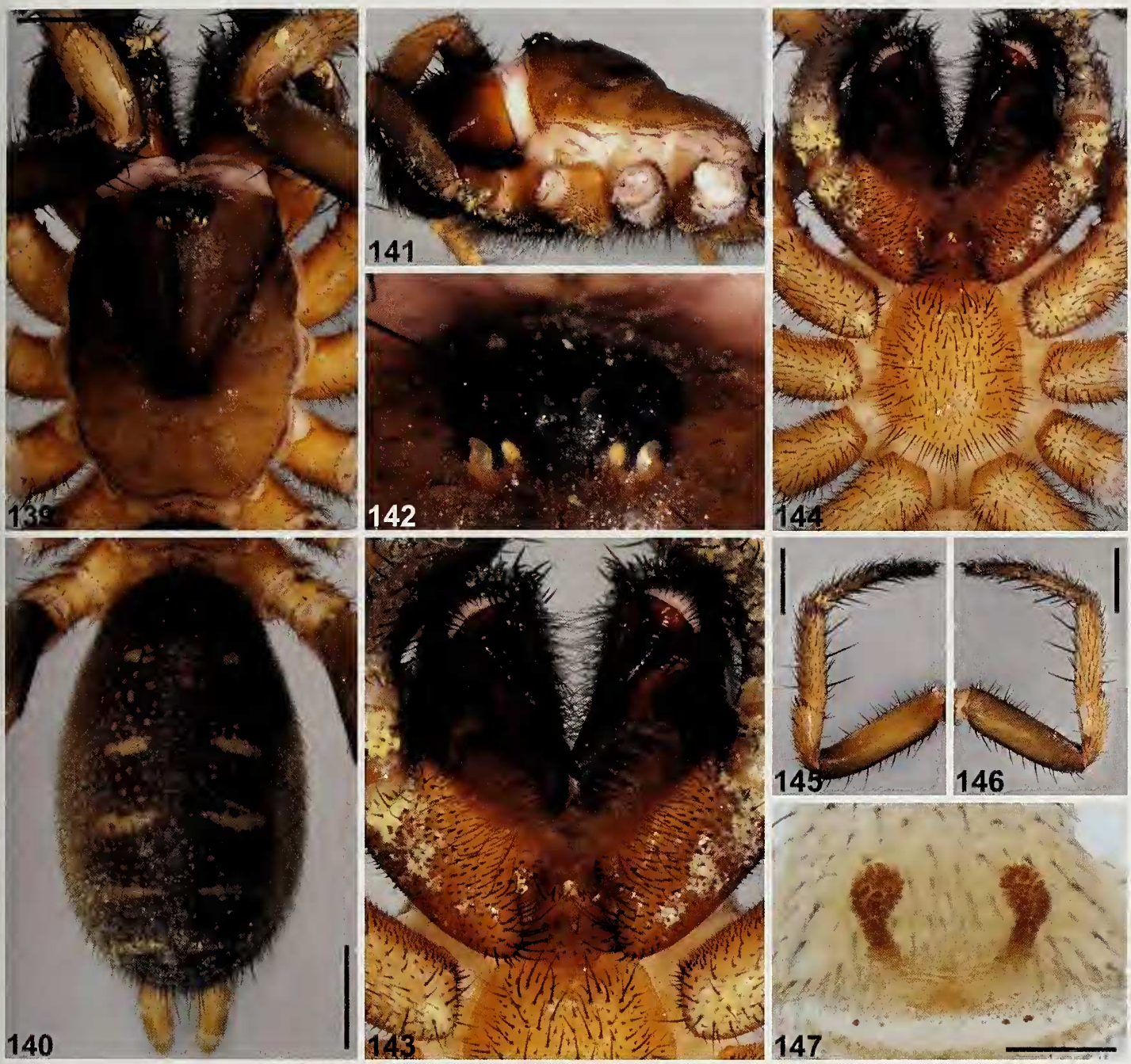
Figures 127–135.—*Cataxia stirlingi* (Main, 1985), male holotype (WAM T16407), somatic morphology: 127–128, carapace and abdomen, dorsal view; 129, cephalothorax, lateral view; 130, eyes, dorsal view; 131, mouthparts, ventral view; 132–133, cephalothorax and abdomen, ventral view; 134, leg I, prolateral view; 135, leg I tibia, prolateral view. Scale bars = 2.0.

Figures 136–138.—*Cataxia stirlingi* (Main, 1985), male holotype (WAM T16407), pedipalp: 136, retrolateral view; 137, retro-ventral view; 138, prolateral view. Scale bar = 2.0.

Males, females and juveniles of this species can also be distinguished from all other species in the *bolganupensis*-group by the following 32 unique mitochondrial nucleotide substitutions (based on five specimens; Fig. 17): ***CO1***: A(73), G(160), A(163), A(253), C(271), C(274), A(412), A(460), C(484), A(487), G(496), G(592), T(619). ***CYB***: A(23), A(114), G(125), T(129), T(132), C(149), A(180), C(230), G(318), T(321), G(415), C(417), T(466), A(477), A(501), T(607), T(634), G(637), A(639).

Description (male holotype).—Total length 13.4. Carapace 5.6 long, 4.5 wide. Abdomen 5.9 long, 4.0 wide. Carapace (Fig. 127) tan, with black ocular region and slightly darker lyra-like pattern on pars cephalica; lateral margins with uniformly-spaced fringe of porrect black setae; fovea straight. Eye group (Fig. 130) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.8; AME separated by slightly more than their own diameter; PME separated by 2.4 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned in line with level of PLE. Maxillae with field of cuspules confined to inner corner (Fig. 131); labium without cuspules. Abdomen (Fig. 128) oval, dark grey-brown in dorsal view, with faint beige-brown mottling and prominent beige-brown sigilla spots, the latter forming four paired bands posteriorly. Dorsal surface of abdomen (Fig. 128) covered with stiff, porrect black setae, each with slightly raised, dark brown sclerotic base; sclerotized sigilla absent. Legs (Figs. 134–135) variable shades of tan, with light scopulae on tarsi I–II; tibia I without clasping spurs but with paired prolateral macrosetae on slightly raised distal protuberance, and adjacent proventral macroseta. Leg I: femur 5.7; patella 2.6; tibia 4.6; metatarsus 5.1; tarsus 3.0; total 21.0. Leg I femur–tarsus/carapace length ratio 3.8. Pedipalpal tibia (Figs. 136–138) 1.9 x longer than wide; RTA relatively short, rounded, with dense field of retrolateral spinules; tibia also with long field of smaller spinules extending along curved retroventral edge (distal to base of RTA), these spinules enlarged into a row of nine maerosetae on short distal retrolateral tibial apophysis. Cymbium (Figs. 136–138) setose but without field of spinules. Embolus (Figs. 136–138) approximately 1.5 x length of bulb, gradually tapering distally without additional adornment.

Description (female, WAM T135848).—Total length 16.6. Carapace 5.7 long, 4.2 wide. Abdomen 8.2 long, 4.8 wide. Carapace (Fig. 139) light tan, with darker brown pars cephalica and mostly blaek ocular region; fovea straight. Eye group (Fig. 142) rectangular, 0.5 x as long as wide; PLE–PLE/ALE–ALE ratio 0.9; AME separated by their own diameter; PME separated by 2.6 x diameter of AME; PME and PLE separated by less than half diameter of AME, PME positioned slightly anterior to level of PLE. Maxillae with field of cuspules confined to inner eorner (Fig. 143); labium without cuspules but with sparse field of posterior spinules (Fig. 143). Abdomen (Fig. 140) oval, dark grey-brown in dorsal view, with beige-grey mottling and prominent beige-grey sigilla spots, the latter forming four paired bands posteriorly (in dorsal view); sclerotized sigilla absent. Legs (Figs. 145, 146) variable shades of tan (darker red-brown in life, with contrasting slate-grey femora; Fig. 4); scopulae absent; tibia I with 3 porrect, ventral spine-like macrosetae; metatarsus I and tarsus I with additional rows of prolateral and ventral spine-like macrosetae. Leg I: femur 4.2; patella 2.4; tibia 2.9; metatarsus 2.5; tarsus 1.7; total 13.5. Leg I femur–tarsus/carapace length ratio 2.4. Pedipalp tan, heavily spinose on tibia and tarsus, without tarsal scopula. Genitalia (Fig. 147) with pair of anteriorly curved, slightly bulbous spermathecae,



Figures 139–147.—*Cataxia stirlingi* (Main, 1985), female (WAM T135848): 139–140, carapace and abdomen, dorsal view; 141, cephalothorax, lateral view; 142, eyes, dorsal view; 143, mouthparts, ventral view; 144, cephalothorax, ventral view; 145, leg 1, prolateral view; 146, leg 1, retrolateral view; 147, spermathecae, dorsal view. Scale bars = 2.0 (139–140, 145–146), 0.5 (147).

each composed of internal, sclerotized glandular chamber and membranous outer wall.

Distribution and remarks.—*Cataxia stirlingi* is the smallest species in the *bolganupensis*-group, and has a highly restricted distribution in the Stirling Range National Park, where it is known only from the western side of the eastern massif, from Bluff Knoll to Moongoongoonderup Hill, with an isolated record (tenuously linked here based on geography) from near Ellen Track, south-east of Bluff Knoll (Figs. 10, 14, 15). The habitat is generally montane heathland and adjacent eucalypt forest above 400 m altitude, where the spiders are patchily distributed and generally rare, although sometimes locally abundant. Its distribution closely abuts that of *C. sandsorum* (Fig. 15), although the two species have never found in direct sympatry. *Cataxia stirlingi* builds a small palisade burrow with a fully open hole and no door, which is usually adorned with a radial skirt of leaves and twigs (Fig. 7). Based on the two male specimens that have been collected/reared, males may wander and mate in mid-late autumn.

Conservation status.—This species has a total (maximum) extent of occurrence of less than 20 km^2, and an actual area of occupancy of significantly less than 10 km^2. Given that the

number of well-defined locations at which the species has been found is less than five, and that there is continuing decline in the quality of habitat in the eastern Stirling Range National Park due to severe *Phytophthora* dieback (Barrett & Yates 2015), climate change in south-western Australia (Indian Ocean Climate Initiative 2002; Barrett & Yates 2015), and a potential increase in the severity and/or frequency of wildfires (e.g. as in 1991, 2000), this species is considered to be 'endangered' (IUCN B1, B2a, b[iii]).

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